THE

TRUTH ABOUT VACCINATION

BEING

A REPORT ON

VACCINATION AS A BRANCH OF PREVENTIVE MEDICINE.

BY

ERNEST HART, D.C.L.,

EDITOR OF THE BRITISH MEDICAL JOURNAL,

CHAIRMAN OF THE PARLIAMENTARY BILLS COMMITTEE OF THE BRITISH MEDICAL ASSOCIATION, CHAIRMAN OF THE NATIONAL HEALTH SOCIETY.

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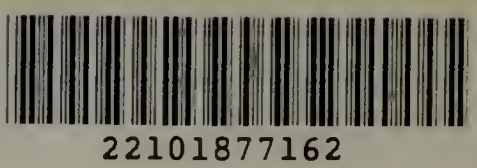

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PREFACE.

My little book entitled *The Truth about Vaccination*, has for some time been out of print. Shortly after its publication I was gratified by receiving the most commendatory letters from Mr. Robert Ceely, of Aylesbury, who wrote, "I have ordered fifty copies to give away amongst my friends," from Sir John Simon, and other eminent authorities. Hardly less satisfactory have been the incessant and noisy but imbecile attempts of the "antivaccinators" to falsify and pervert the incontrovertible figures presented. I have since been repeatedly urged to reprint this address, and the last fifty copies have long been in use on loan to various persons, medical men, lecturers, and others, who have applied for copies which were not to be purchased. I hesitated to reprint it in its original form, because the march of events has brought about the adoption of vaccination from the calf and other official steps which I advocated and initiated. They have since come into practical operation, and the book required revision and bringing

up to date in respect to its statistics and other matters. Subsequently the institution of a Royal Commission on Vaccination, and the considerable amount of evidence given before them in the course of their five years' sitting, added a great mass of fresh data which required analysing, for which the time at my disposal was limited by other calls upon it. I have now, however, completed the somewhat laborious task of analysing all available facts up to date, and of condensing them within very moderate limits. I hope the present issue may prove as useful and as acceptable as the first edition was found to be.

I have to thank Mr. W. W. Armstrong for the most valuable aid in the laborious work involved in the preparation of this edition. It has been a labour of love and I hope of usefulness.

ERNEST HART.

38, Wimpole Street,
London, W.

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THE

TRUTH ABOUT VACCINATION.

I.

THERE is a paragraph in the last-issued report of the medical officer of the Local Government Board which deserves more than the passing notice it is likely in most instances to receive: "From the returns made by vaccination officers, it appears that of children whose births were registered in England and Wales during the year 1890, there remained 11·3 per cent. not finally accounted for as regards vaccination, the percentage for the metropolis being 13·9, and for the provinces 10·9. These figures indicate a larger amount of default in regard of vaccination than any which has been recorded since the passing of the Vaccination Act, 1871. In the metropolis the percentage of births unaccounted for has, during the ten years 1881–90, risen almost continuously from 5·7 to 13·9; and in the provinces there has, during the same period, been an altogether unbroken rise from 4·3 to 10·9. A marked increase in these rates took place as regards children whose births were registered during the year 1888, and whose vaccination became due, at the latest, during 1889. In the metropolis the amount of default indicated is now nearly two and a half times as great, and in the provinces it is nearly two and a quarter times as great as it was ten years ago. The figures are very significant, affording as they do an indication of a steadily growing increase in the younger population of persons who are altogether without protection against small-pox."

This falling off in infantile vaccination is no doubt largely

due to the absence of any widespread epidemic of small-pox throughout the country within recent years, a feeling of false security having thus been created, which has led a number of parents to put off for the moment the temporary inconvenience of having their infants vaccinated. On more than one occasion there has recently been apprehension of small-pox spreading in various localities, and there has been the usual rush for vaccination amongst the unprotected whenever small-pox threatens, and which, by straining the local resources to their utmost limits, is not calculated to secure in all cases the most efficient protection. Happily, however, in only a few centres has the disease assumed alarming proportions, and with the subsidence of the immediate danger, apathy has again set in; but although individual apathy has had much to do with the falling off in the amount of infantile vaccination, a great deal of the mischief is attributable to the baneful influence of a number of opponents of the system who by disseminating gross misrepresentations calculated to create a distrust of vaccination, have caught the attention of those who convince themselves that vaccination is useless. This is shown by the fact that the greatest neglect has grown up in those towns in which the leaders of the opposition are most active.

The growing neglect of vaccination in the early years of life is, nevertheless, a serious menace to the future health of the community, which must ere long be strongly grappled with. In this matter of life or death antivaccinators are assuming a very grave responsibility, and it is the duty of those who realise the approaching danger to do their utmost to avert its consequences. English common sense may be trusted eventually to sift the wheat from the chaff, but in the meantime every effort should be made to prevent any fatal retrograde step being taken.

Vaccination has now for nearly a century stood the test of practice, and to-day it remains one of the greatest medical prophylactics which the world has ever known. To say that it has been maintained by the medical profession for their own pecuniary benefit is so obviously absurd as scarcely to deserve notice. Only a very small proportion of doctors derive any

substantial benefit from the practice of vaccination, and those who consider that the bulk of medical men are so inordinately mercenary as to lend themselves to the support of a false system for the sake of a few shillings a year should remember that it is the prevalence of disease and not its prevention which pays the doctor best, and that a widespread outbreak of small-pox will pay far better than the eighteenpenny fees to be earned by vaccination. It seems to be too often forgotten that all measures for improving the general health of the community have emanated from and been fostered by the medical profession, and that, to take a striking example, the sanitary science of which England is to-day justly proud, and which has led during the last fifty years to a marvellous reduction in the mortality from filth diseases and an increase in the average length of life, owes its origin and development to medical men. Had vaccination not possessed the powers claimed for it the medical profession would have been the first to cast it aside as they have rejected other practices.

It has been truly said that if those who so readily neglect vaccination at the bidding of a few energetic agitators could for a moment look on the sight too common in every small-pox epidemic—of a family which has been living in the same house and under precisely the same conditions, stricken by small-pox the unvaccinated members developing the disease in all its natural hideous loathsome virulence, whilst the recently vaccinated or re-vaccinated have escaped altogether, and those who, years previously, have been vaccinated more or less efficiently have escaped with a few spots and slight constitutional disturbance—the perverted statistics and the sophistries of the antivaccinators would for ever be brushed aside and the apathetic would hasten to secure for themselves and their offspring the protection which vaccination affords. Such a living picture would be repulsive, but it would teach a valuable lesson. It is contact with such sights that has convinced the medical profession as a body of the value of vaccination.

In its natural state small-pox is a peculiarly loathsome disease, which has always been fatal to a very large proportion of those attacked by it. It is eminently infectious from person to

person ; it seizes, with very few exceptions, all who for the first time come within its reach, and, when not fatal, it now, as before the introduction of vaccination, disfigures its victim for life. Looking back at its past history, we find that in 1518 it helped to complete the depopulation of St. Domingo, which fire, sword, and famine had begun; and soon afterwards, in Mexico, it even surpassed the cruelties of conquest, suddenly smiting down 3½ millions of population. Mr. Prescott, in his *Conquest of Mexico*, describes the epidemic as "sweeping over the land like fire over the prairies, smiting down prince and peasant, and leaving its path strewn with the dead bodies of the natives, who (in the strong language of a contemporary) perished in heaps like cattle stricken with murrain." In Brazil, in Siberia and Kamschatka, in Greenland and Iceland, in Borneo, on the Gold Coast, in Madagascar, its devastations were similar. Striking accounts of its ravages among the North-American Indians in very recent times may be gathered from Mr. Catlin's *Lectures and Notes on the Manners, Customs, and Conditions of the North-American Indians.* In one place, Mr. Catlin observes, "30 millions of white men are now scuffling for the goods and luxuries of life, over the bones and ashes of 12 millions of red men, 6 millions of whom have fallen victims to small-pox, and the remainder to the sword, the bayonet, or whisky." More recently we have the remarkable evidence of the late Surgeon-Major Parke before the Vaccination Commission, as to the virulence of small-pox among the natives of Central Africa, when uncontrolled by vaccination. In England, according to calculations of Dr. Lettsom, about the year 1805, the average annual deaths from small-pox were about 3,000 out of every million of population, a death-rate which, with the present population in England, would give an average of nearly 90,000 deaths from small-pox a year. Nearly one-tenth part of all the persons who died in London within the Bills of Mortality during the last half of last century died of this one cause. The younger part of the population were peculiarly its victims, and royal and noble families were not exempt.

The ravages of small-pox are not, however, half enumerated in the list of the myriads whom it has killed. From the

earliest to the latest records of the disease there is constant mention of the tax which it has levied upon survivors. The eloquent passage in which Macaulay refers to this, when comparing the ravages made by small-pox in this country towards the close of the seventeenth century with those of the plague, is well known. Our great historian justly assigns to small-pox the foremost place as the "most terrible of all the ministers of death." "The havoc of the plague," says he, "had been far more rapid, but the plague had visited our shores only once or twice within living memory. The small-pox was always present, filling the churchyards with corpses, leaving in those whose lives it spared the hideous traces of its power, turning the babe into a changeling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to the lover."

This description applied with at least equal force a hundred years later. Few indeed, then, were those who were not, at some time or other of their lives, attacked by this fell disease, and happy was it for any one so attacked that he should escape with unimpaired health, or without serious disfigurement. Among those who outlive it, says De la Condamine, many either totally or partly lose their sight or hearing, many are left consumptive, weakly, sickly, or maimed, many are disfigured for life by horrid scars, and become shocking objects to those who approach them. Sir Gilbert Blane, at a later period, quoted a report of the Hospital for the Indigent Blind to the effect that two-thirds of those who applied there for relief had lost their sight by small-pox.

Such was the state of affairs when towards the middle of the eighteenth century the practice of inoculation was introduced into this country from the East, and prevailed until the discovery of vaccination by Jenner towards the close of the century. I do not here propose entering at length on a discussion of the question, What is vaccination? There is in my mind very little doubt that human small-pox and cow-pox are derived from one and the same infection, though there are differences in their effects. Which is the ancestor of the other remains a moot point, but that small-pox and cow-pox are identical was Jenner's firm belief, and the most recent scientific

investigations of the subject altogether go to strengthen this view.*

A favourite and showy argument of the antivaccinators is that vaccination has not fulfilled Jenner's first hope that it would be "an antidote capable of extirpating from the earth a disease which is every hour devouring its victims—a disease that has ever been considered the severest scourge of the human race." But this was not quite Jenner's more matured opinion. He was well aware of the fact that even an attack of natural small-pox did not invariably render a person immune from a subsequent attack of the disease, and, within a very few years of the discovery of vaccination, cases occurred in subjects who had been vaccinated. What he really claimed was, to use his own words, that vaccination "duly and efficiently performed will protect the constitution from subsequent attacks of small-pox as much as that disease itself will. I never expected it would do more," he said, "and it will not, I believe, do less."

A century's experience has fully borne out Jenner's opinion. Vaccination, "duly and efficiently performed" in infancy, and repeated at the age of puberty, has shown itself to be an almost absolute protection against small-pox, whilst in those cases in which small-pox occurs after vaccination the disease is, almost without exception, so far modified that often its identity is, in its early stages, unrecognised. Only last year in Blackburn, to take a very recent illustration, the medical officer of health met with a number of cases of small-pox in vaccinated persons, where the disease was so modified that the patients went about their work without being aware of the nature of the illness which was upon them. Cases of the same sort were also recently met with by Dr. Bruce Low when investigating an outbreak of small-pox at Hastings. It is in dealing with the statistics which prove these statements that the antivaccinators have practised the grossest perversion and misrepresentation. It is an indisputable fact, shown by the

* In the annual report for 1892-93 of the Medical Officer of the Local Government Board is contained a very interesting report by Dr. E. Klein of experiments carried out by him in London. Dr. Simpson, of Calcutta, has also recently carried out experiments on similar lines and obtained similar results, going to prove the identity in origin of small-pox and vaccinia.

Registrar-General's returns from year to year, that small-pox has greatly decreased within the present century, and especially within the last 50 years. In his *Vital Statistics*, Dr. Farr, whose position gave him exceptional facilities for obtaining accurate information, and whose integrity is unimpeachable, has given the following instructive table with regard to the London death-rate from small-pox :

Years.	Average Annual Deaths per Million from all Causes.	Average Annual Deaths per Million from Small-Pox.
1660–79	80,000	4,170
1728–57	52,000	4,260
1771–80	50,000	5,020
1801–10	29,200	2,040
1831–35	32,000	830

Continuing these figures for subsequent periods, we get :

Years.	Average Annual Deaths per Million from all Causes.	Average Annual Deaths per Million from Small-Pox.
1838–53	24,900	513
1854–71	24,200	388
1872–82	22,100	262
1883–92	19,800	73

Unfortunately, complete statistics as to last century's small-pox are not available for the whole of the country, but, as far as they go, they tell the same tale. Since 1838, when registration became compulsory, we have definite information, and it will be seen that since that date the decline has been very marked. Beginning with 1838, we find that the annual small-pox death-rates for the country for subsequent years are, in consecutive order, as follows: 1,064, 589, 661, 400, 168 (here occurs an interval of four years, 1843 to 1846, during which

the figures are not available), 246, 397, 264, 262, 389, 401, 171, 151, 131, 116, 202, 329, 193, 136, 64, 78, 286, 364, 301, 139, 114, 91, 67, 113, 1,012, 821, 98, 88, 35, 99, 173, 74, 21, 25, 119, 50, 36, 83, 104, 10, 18, 36, 1, 1, 2, 15.

But the most remarkable fact disclosed by a careful examination of the small-pox statistics is the changed incidence of the disease on different age periods since the introduction of vaccination. Whereas in prevaccination times small-pox was essentially a disease of childhood, some 800 out of every 1,000 small-pox deaths being of children under 5 years of age, and 150 of the remaining 200 being of children between 5 and 10 years (even as late as 1839 88 per cent. of the small-pox deaths in England were in children under 10 years of age), it has in recent years lost that peculiarity, as will be readily seen from the following table. In reading this table it must be borne in mind, that although vaccination came into use early in the present century, no public provision for its gratuitous performance was made until 1840, it was not obligatory until 1853, and legislative arrangements for its systematic enforcement were not made until 1871.

MEAN ANNUAL DEATHS FROM SMALL-POX AT SUCCESSIVE LIFE PERIODS PER MILLION LIVING AT EACH SUCH LIFE PERIOD, 1847–53, 1854–71, AND 1872–91.

Period.	All Ages.	0–5.	5–10.	10–15.	15–25.	25–45.	45 and Upwards.
1. Vaccination optional, 1847–53	305	1,617	337	94	109	66	22
2. Vaccination obligatory, but not efficiently enforced, 1854–71	223	817	243	88	163	131	52
3. Vaccination obligatory, but more efficiently enforced by vaccination officers, 1872–91 .	89	177	95	54	97	86	38

As pointed out by the Registrar-General in his 43rd Annual Report with reference to a similar table: "The figures show conclusively that coincidently with the gradual extension of the practice of vaccination, there has been, in the first place, a gradual and notable decline in the mortality from small-pox

at all ages; and, in the second place, that this decline has been exclusively among persons under ten years of age, and most of all among children under 5, and thirdly, that after the age of 10 years the mortality, so far from having declined, has actually increased; very slightly among persons of from 10 to 15 years of age, but very greatly for persons older than this; and, lastly, that the increase has been the greater the more advanced the time of life."

This changed incidence of small-pox is one of the most remarkable and convincing proofs of the efficacy of vaccination, and one which may profitably be studied by a close examination of the facts connected with each and all of the recent small-pox epidemics.

So much strength has been expended by the opponents of vaccination in disputing and distorting the older statistics, with the object of discrediting the evidence based upon them, that there may be especial advantage in studying the most recent outbreaks before they pass out of reach for the purpose of verification. Even here many red herrings will doubtless be drawn across the scent. As regards adults, there will, of course, still be the usual cavilling as to the classification of patients as "vaccinated" or as "unvaccinated." This difficulty, however, cannot arise as regards the children in recent epidemics, the records of whose vaccination are still in existence, and here the evidence in favour of vaccination is simply overwhelming and unanswerable.

In the following table, therefore, I have endeavoured to summarise the facts relating to all the more important recent small-pox outbreaks in this country, respecting which statistics and reports have reached me, and I feel that the more that information is studied the more clearly does it bear irrefutable evidence of the protective value of "efficient" vaccination. With respect to some of the recent outbreaks I have not been able to ascertain in detail the age distribution of the cases, and they therefore cannot be tabulated uniformly. These I have omitted from the tabular statement, but I have subsequently dealt with the facts individually.

I should have been glad to have added to this table columns showing how the population in each town was made up at the

TABLE SHOWING THE DISTRIBUTION OF SMALL-POX CASES AND DEATHS

Period of Epidemic.	Towns.	Population.	Total Small-Pox.		
			Cases.	Deaths.	Mortality Per Cent. of Cases.
March, 1887, to Feb., 1888	Sheffield	274,112	4,677	474	10·1
Year 1892	,,	329,585	47	3	6·4
,, 1893	,,	333,922	102	4	3·9
Aug., 1892, to Dec., 1893	Leicester	184,547	347	21	6·05
May, 1892, to March, 1893	Warrington	54,000	598	60	10·03
1892–3	Halifax	84,000	513	44	8·5
Jan., 1892, to June, 1893	Oldham (Westhulme Hospital)	166,000	605	63	10·4
1893	Blackburn	124,000	79	8	10·1
1893	Bolton	117,000	44	6	13·6
1892	Bradford	219,262	25	4	16·0
1892	Brighouse	10,500	134	15	11·2
1893	,,		23	2	8·7
1893	Derby	87,000	46	7	15·2
1892–3	Glasgow	677,883	259	18	6·9
1894	Hastings	63,466	86	9	10·4
1893	Huddersfield	97,500	48	2	4·1
1893	Keighley	32,000	72	7	9·7
1892	Liverpool	517,514	194	15	7·7
1892–3	Manchester	515,598	378	22	5·8
Nov., 1892, to June, 1893	Middleton	22,162	22	2	9·1
April to July, 1894	,,		34	4	11·7
1892	Ossett	11,100	19	1	5·2
1893	,,		26	0	0·0
1893	Pudsey	13,400	17	1	5·9
1893	Salford	203,431	174	21	12·0
1893	Southampton	65,325	152	8	5·2
1893	Swansea	93,816	23	1	4·3
Oct., 1892 to July, 1893	York	66,912	72	7	9·7
1893	Birmingham *	487,897	979	70	7·1
1887–8	Bristol *	225,028	327	37	11·3
1893	,,		164	19	11·5
1893	Walsall *	74,000	778	71	9·1
	Totals		11,064	1,026	9·2

* In these instances the available statistics only enable the cases to be of under or over

IN A NUMBER OF LARGE TOWNS BETWEEN THE YEARS 1887 AND 1894.

Under 10 Years of Age.									Over 10 Years of Age.								
Vaccinated.			Unvaccinated.			Doubtful.			Vaccinated.			Unvaccinated.			Doubtful.		
Cases.	Deaths.	Mortality Per Cent. of Cases.	Cases.	Deaths.	Mortality Per Cent. of Cases.	Cases.	Deaths.	Mortality Per Cent. of Cases.	Cases.	Deaths.	Mortality Per Cent. of Cases.	Cases.	Deaths.	Mortality Per Cent. of Cases.	Cases.	Deaths.	Mortality Per Cent. of Cases.
353	6	1·7	228	100	43·9	—	—	—	3,774	194	5·10	322	174	54·2	—	—	—
1	0	0·0	2	0	0·0	—	—	—	36	2	5·50	8	1	12·5	—	—	—
6	0	0·0	7	0	0·0	—	—	—	79	3	3·70	3	0	0·0	7	1	14·2
2	0	0·0	105	15	14·3	—	—	—	190	1	0·52	48	4	8·3	2	1	50·0
24	0	0·0	32	13	40·6	1	1	—	506	32	6·30	34	13	38·2	1	1	—
4	0	0·0	67	22	32·1	—	—	—	421	8	1·90	21	14	66·0	—	—	—
15	0	0·0	97	27	27·8	2	1	50·0	431	19	4·40	51	14	27·4	9	2	22·2
3	0	0·0	—	—	—	1	1	—	68	2	2·90	4	3	75·0	3	2	66·6
1	1	—	—	—	—	—	—	—	30	0	0·00	6	3	50·0	7	2	25·0
2	0	0·0	1	1	—	—	—	—	20	2	10·00	2	1	50·0	—	—	—
6	0	0·0	19	7	36·8	—	—	—	104	6	5·70	5	—	40·0	—	—	—
3	0	0·0	2	0	0·0	—	—	—	17	2	11·70	—	2	—	1	0	0·0
1	0	0·0	6	3	50·0	—	—	—	31	2	6·40	8	2	25·0	—	—	—
10	0	0·0	2	2	100·0	—	—	—	238	11	4·60	9	5	55·5	—	—	—
4	0	0·0	10	4	40·0	—	—	—	63	3	4·70	2	0	0·0	7	2	28·5
—	—	—	1	1	—	—	—	—	35	0	0·00	11	1	9·1	1	0	0·0
1	0	0·0	24	4	16·6	—	—	—	30	1	3·30	17	2	11·7	—	—	—
7	1	14·4	11	5	45·5	—	—	—	163	5	3·07	13	4	30·7	—	—	—
4	0	0·0	19	3	15·7	—	—	—	332	14	4·20	23	5	21·7	—	—	—
2	0	0·0	3	1	33·3	1	0	0·0	11	0	0·00	2	1	50·0	3	0	0·0
0	0	0·0	8	2	25·0	—	—	—	25	1	4·00	1	1	—	—	—	—
0	0	0·0	1	1	—	—	—	—	18	0	0·00	—	—	—	—	—	—
0	0	0·0	1	0	0·0	—	—	—	23	0	0·00	2	0	0·0	—	—	—
0	0	0·0	1	0	0·0	—	—	—	13	0	0·00	3	1	33·3	—	—	—
7	0	0·0	20	7	35·0	—	—	—	125	8	6·40	17	5	29·4	5	1	20·0
13	0	0·0	8	3	37·5	1	0	0·0	103	0	0·00	7	4	57·1	20	1	5·0
3	0	0·0	—	—	—	—	—	—	19	0	0·00	1	1	—	—	—	—
2	0	0·0	5	1	20·0	—	—	—	56	4	7·10	8	1	12·5	1	1	—
Under 15 Years of Age.									Over 15 Years of Age.								
107	0	0·0	69	20	29·0	4	0	0·0	740	38	5·10	36	12	33·3	23	0	0·0
64	0	0·0	22	12	54·5	—	—	—	208	11	5·30	33	14	42·2	—	—	—
12	0	0·0	15	6	40·0	—	—	—	126	8	6·33	11	5	45·4	—	—	—
123	2	1·6	141	41	29·0	4	3	75·0	431	4	0·90	66	20	30·3	13	1	7·7
780	10	1·2	927	301	32·4	14	6	42·8	8,466	381	4·50	774	313	40·6	103	15	14·5

distributed according as they were under or over 15 years of age, instead
10 years of age.

time of the epidemic, how many of the inhabitants were vaccinated, and how many were unvaccinated; how many of the children under 10 years were vaccinated, and how many were not. But as calculations of that kind could only be approximately accurate, it might needlessly afford the opponents of vaccination an opportunity for quibbling, and might thus lead to obscurity of the main points which the indisputable figures amply prove. These points are that the vaccinated children under 10 have been almost immune from death by small-pox, and that where they have contracted the disease they have suffered from it in its mildest form, often having only "a few spots" and little constitutional disturbance; whilst, on the other hand, the unvaccinated children have suffered in every instance more severely, some 20 to 50 per cent. of the cases amongst them terminating fatally. The unvaccinated children have, in short, suffered terribly, whilst the vaccinated have suffered very lightly, and this in spite of the facts that, broadly speaking and taking the aggregate of the enumerated towns and districts, the vaccinated are seven or eight times as numerous as the unvaccinated, that the vaccinated include a large proportion of children whose vaccination has been very imperfectly performed, that both the vaccinated and the unvaccinated are drawn from the same aggregate population, and that, again speaking broadly, all live in the same sanitary conditions. The only line of broad distinction between the two classes of children is in regard to their vaccination. Further, as regards adults, we find that although a larger number of vaccinated than of unvaccinated cases occurred, the disease in the one was with comparatively few exceptions, mild; whilst it was, with comparatively few exceptions, severe in the unvaccinated. This is broadly shown by the fact that only 4·5 per cent. of the vaccinated cases terminated fatally, whilst as many as 40·6 per cent. of the unvaccinated cases died. We must also, in fairly considering this question, bear prominently in mind that the so-called "vaccinated" often scarcely deserve to be so classed, the evidence as to their original vaccination being very vague, and the marks on their arms being in many cases quite invisible. This will be seen to be an important element by those who

wish to arrive at a just appreciation of this vitally important national question.

I wish now to set out a variety of details which it has been found impossible to embody in the tabular statement on a preceding page, but which are of great interest and importance. I have placed the Sheffield epidemic of 1887—8 at the head of the table for various reasons. Sheffield is not a centre of anti-vaccination. The law has been carried out there so well that, roughly speaking, some 97 or 98 per cent. of the population are more or less efficiently protected by vaccination. Consequently, when small-pox broke out there in 1887, "well-vaccinated Sheffield" in the throes of a small-pox epidemic was pointed to as about to settle once for all the long-debated vaccination question. The vast importance of the occurrence was so evident that an exhaustive investigation of the matter was wisely instituted at once by the Government through the Local Government Board. This arduous task was entrusted to Dr. F. W. Barry, and his admirable report on the matter, together with Sir George Buchanan's excellent introductory summary, deserves to be carefully studied by anyone desirous of learning whether or not vaccination is what its supporters claim for it. The facts disclosed in that report form such a monumental testimony to the value of vaccination that nowadays one seldom hears the Sheffield epidemic referred to by antivaccinators.

Dr. Barry commenced his inquiry at a time when some 300 new cases of small-pox were occurring each week in the borough, and he was consequently in a position, by prompt personal inquiry and personal observation, to place beyond cavil many matters of fact which otherwise might have been disputed or distorted. He proceeded, with assistants, to make a house-to-house census of the infected localities. I can only give here the broad important facts disclosed by that census. It was found that the total enumerated population of the borough, or rather of the infected divisions of the borough, was 274,112, of whom 268,397 were classed as vaccinated and 5,715 as unvaccinated. Under ten years of age there were 68,236 vaccinated children, and of these 353 (or 0·51 per cent.) were attacked, and 6 (or 0·009 per cent.) died; whilst at the

same age there were only 2,259 unvaccinated children, yet of these 228 (or 10·09 per cent.) were attacked, and 100 (or 4·4 per cent.), excluding for obvious reasons children under 1 month of age, died. Above 10 years of age there were 196,905 vaccinated persons, and of these 3,774 (or 1·9 per cent.) were attacked, and 194 (or 0·09 per cent.) died; whilst there were only 3,429 unvaccinated persons, yet of these 322 (or 9·3 per cent.) were attacked, and 174 (or 5·07 per cent.) died. There were, in addition, 3,256 vaccinated and 27 unvaccinated individuals, whose ages could not be ascertained, and who have therefore been excluded from the above calculations, together with the 24 and 2 cases of small-pox which occurred among them respectively.

These figures are by themselves sufficiently convincing as to the value of vaccination; but I cannot refrain from quoting the following paragraphs from Sir George Buchanan's masterly analysis of Dr. Barry's report:

"First, of the children under 10 years of age living in Sheffield during 1887-88, under the common conditions of infection in the whole borough:

"Per 1,000 of the number of children in each class:	
"The attack-rate of the vaccinated was	5·00
"The attack-rate of the unvaccinated was	101·00
"The death-rate of the vaccinated was	0·09
"The death-rate of the unvaccinated was	44·00

"Under the general circumstances of the Sheffield epidemic, therefore, the vaccinated children had, as compared with the unvaccinated children living in the town, a 20-fold immunity from attack by small-pox, and had a 480-fold security against death by small-pox. The above relates to the general children —population of the borough;" but "children living in houses actually invaded were, of course, exposed to an intenser and more continuous infection," and presented even stronger contrasts.

"Next, concerning persons over 10 years of age living in Sheffield during 1887-88 under the common conditions of infection of the borough. The vaccinated and unvaccinated members of this class are found to have always differed to a considerable degree from each other, both in regard of attack

and of death, and also whether the borough as a whole or its component subdistricts be examined. But this degree of difference, considerable though it has been, has not been nearly so large as in the class of children.

"Per 1,000 of the number of persons over 10 in each class
"The attack-rate in persons twice vaccinated was . 3·00
"The attack-rate in persons once vaccinated was . 19·00
"The attack-rate in persons not vaccinated was . 94·00
"The death-rate among persons twice vaccinated was . 0·05
"The death-rate among persons once vaccinated was . 1·00
"The death-rate among persons not vaccinated was . 51·00

"Under the general circumstances of the Sheffield epidemic, therefore, the twice vaccinated persons over 10 years of age, as compared with the unvaccinated persons of the same age living in the town, had a 31-fold immunity against attack by small-pox, and had a 640-fold security against death by small-pox."

As regards the more limited outbreak in Sheffield in 1893, the medical officer of health records that of the 85 vaccinated cases, 30 were varioloid, 30 "discrete" or mild small-pox, 11 "coherent," and only 14 confluent. Nine of these last cases showed bad vaccination marks.

II.

Small-Pox at Leicester.

I have placed Leicester next to Sheffield in the tabular statement (see British Medical Journal, March 2nd, p. 487), because it has become the centre of the antivaccination movement; the performance of vaccination has been practically suspended in the town for several years past, and a gigantic experiment is being tried there of endeavouring to cope with small-pox by, curiously enough, substituting for compulsory infantile vaccination another set of even harsher compulsory measures—compulsory isolation, compulsory quarantine for twelve or fourteen days, and such like. The comparative immunity of "unvaccinated" Leicester from small-pox for

several years past was becoming the stock argument of the antivaccinators. It is especially instructive, therefore, to see how small-pox behaves there on its introduction. From the official report of Dr. Priestley, the able medical officer of health, it appears that during the epidemic of 1892-3 there were:

UNDER 10 YEARS OF AGE.

Vaccinated cases, 2; deaths, 0 . . . . = 0·00 per cent.
Unvaccinated cases, 105; deaths, 15 . . . = 14·30 „

OVER 10 YEARS OF AGE.

Cases once vaccinated, 176; death, 1 . . = 0·57 per cent.
Unvaccinated cases, 48; deaths, 4 . . . = 8·30 „
Revaccinated cases, 14; deaths, 0 . . . = 0·00 „
Doubtful as to vaccination—that is, no marks visible—cases, 2; death, 1 . . . . = 50·00 „

This is convincing enough by itself, but the health officer who personally saw and had to deal with every one of the cases, further reports that: "It is a noteworthy fact that of the 19 deaths amongst the unvaccinated, 16 were of a malignant or semi-malignant type, that is, were accompanied with extravasations of blood in various parts of the body—the skin, eyes, lungs, etc. In fact, some of the cases have been of a most revolting and distressing character, calling to mind the descriptions given by some of the early writers in speaking of the 'black small-pox.'" Among the unvaccinated, 35 cases (22 of them in children under 10 years) were malignant or semi-malignant, and of these 19 recovered, "to be left, unfortunately, disfigured for life." No vaccinated case was of a malignant or semi-malignant type, though 10 vaccinated out of the 176, and 1 doubtfully revaccinated out of the 14, were of a severe confluent type; only 1 of the vaccinated cases died. Thirteen out of the 14 revaccinated cases were either mild or very mild, and aborted. It will have been seen from the table that there were 2, and only 2, cases amongst vaccinated children under 10 years of age during the whole epidemic, and as regards these the medical officer of health is doubtful if they were cases of small-pox at all, so very mild and abortive were the symptoms.

The length of stay in hospital of the different classes of patients is another interesting and practically important point, and it was observed during this Leicester epidemic that the

average length of stay was—among the vaccinated under 10 years, 14·5 days; unvaccinated under 10 years, 47·3 days; vaccinated over 10, 28·6 days; revaccinated, 26·8 days; had previous small-pox attacks, 14 days; unvaccinated, 44·2 days.

Leicester has also repeated the experiences of other epidemics as regards the immunity from attack enjoyed by the efficiently protected nurses and attendants at the small-pox hospitals. Of 40 officials connected with the hospital, 34 were "efficiently" protected either by revaccination or by a previous attack of small-pox, as shown by extensive "pitting," and not one contracted small-pox. The remaining 6 were "inefficiently" protected, having been vaccinated only in infancy, and having refused revaccination. Five of these contracted small-pox and 1 died. The only one of these 6 "inefficiently" protected to escape was the matron, who, of course, was not much exposed to the contagium, taking no part in the actual nursing of small-pox cases, and only entering the wards occasionally.

I propose to refer, later on, to the evidence that sanitary conditions had nothing to do with the relative immunity of the vaccinated as compared with the unvaccinated. There is much that I would like to quote from Dr. Priestley's valuable report if space admitted of it, but for the moment I must be satisfied with the following:—

After comparing the condition of Leicester in 1871-72 with its condition in 1892-93, he adds that in the latter year, with the "most stringent precautions taken in the way of isolation, disinfection, and quarantining, with a Notification Act well carried out, and with excellent sanitation, there have been 347 cases, showing that 1·8 per 1,000 of the whole population (estimated at 184,547) have been attacked, and the ratio of mortality to cases has been 1 to 16·5. In 1892-93 Leicester was equally well vaccinated (that is, when compared with 1871-72) as regards its adult population, but the antivaccination movement is beginning to tell, especially upon the children under 10 years of age, and it is chiefly these, proportionately, who have suffered most severely from the ravages of small-pox. This unvaccinated element under 10 years of age is, in my opinion, Leicester's weak point; and certainly has proved so during our late epidemic. Taking the children under 10 years,

there have been 105 unvaccinated who have passed through our hands, whilst I am able to make the significant statement, that there has not been a single case of a vaccinated child under 10 years of age treated for small-pox at the hospital during the whole of our epidemic. That many such vaccinated children have come into contact with small-pox is proved by the quarantine statistics, from which it is seen that 91 vaccinated children under 10 years were in infected houses. Comparing these with the 271 unvaccinated children in quarantine of the same age period, we find that the incidence on the vaccinated bears to the incidence on the unvaccinated the proportion of 1 to 8·7 per cent.—that is, the unvaccinated children under 10 years of age have suffered eight times as severely as the vaccinated ones. The severity of the attacks must also be noticed, and the extensive pitting and scarring left in the unvaccinated children. We have seen that out of a total of 105, 83·8 per cent. have suffered severely or very severely, whilst 16·2 per cent. have suffered mildly or very mildly."

There is yet another interesting feature in the Leicester "experiment," and that is the system of "quarantining" for small-pox. By "quarantines," Dr. Priestley explains, "are meant practically persons in small-pox infected houses, for it is clear that such inmates must, more or less, have been exposed to the contagion. Such persons may be quarantined (1) in separate hospital wards and reception houses specially provided, a method, by the way, I do not recommend, whether from the point of view of economy or practicability; or (2) at their own homes, a method I have found satisfactory, both financially and otherwise. The value of quarantining has been well shown during the Leicester epidemic, and I have been able, with comparative ease, by means of my inspectors, to quarantine hundreds of persons at their own homes and with a success that has been gratifying both financially and otherwise. One thousand two hundred and sixty-one persons were quarantined, and of these 123 sickened (that is, 9·7 per cent.). Each infected house was visited daily by one or other of the inspectors for fourteen or sixteen days. Other persons who had come into contact with small-pox were also watched in the same way. These 'quarantines' were strongly urged—practically com-

pelled—not to go to work for the whole or part of their quarantine period of fourteen to sixteen days, and during that time have been made such monetary allowances as the Committee have thought fit, the sum advanced in each case being no more than sufficient to cover rent and maintenance." This is a kind of compulsion which it must be evident would not be tolerated to any great extent if it be seriously thought in some quarters that the system might be made general. In comparison with it the compulsion of infantile vaccination is a trifling interference with individual liberty.

Warrington Experiences.

The experiences at Warrington in 1892-3 are scarcely less instructive than those of Leicester. The figures set out in the table already given speak eloquently for themselves, and need not here be repeated. But, from Dr. J. G. Gornall's exhaustive report on the subject I take the following further facts bearing on the influence of vaccination. A census was made of practically all houses in Warrington invaded by small-pox, with the following results. In 397 houses invaded by small-pox up to the end of March, 1893 (being the total number of invaded dwellings up to that time, excepting only 7 lodging-houses), a total population of 2,424 persons was enumerated. Of these 545, or 22·4 per cent., were attacked by small-pox, and 56, or 2·3 per cent., died; 663 of them were under 10 years of age; of these, 51, or 7·6 per cent., were attacked, and 14, or 2·1 per cent., died; 1,761 were aged 10 years and upwards, and 494, or 28 per cent., were attacked, while 42, or 2·3 per cent., died. That is to say, the attack-rate in persons over 10 years of age was four times that in persons of the earlier period, while the death-rates are about the same. In other words, the diminishing protection afforded by vaccination as life advances is shown by an increased liability to attack. And since the mortality under 10 years of age is practically confined to the unvaccinated, the non-increase of the death-rate in the older class, coincidentally with an augmented susceptibility, is evidence of the power of vaccination to mitigate the severity of the disease after it has ceased to be able to prevent it altogether. Again, of the 2,424

persons already referred to, 2,313 were vaccinated, and 481, or 20·7 per cent., of these were attacked, and 32, or 1·3 per cent., died. Of the remaining 112 unvaccinated persons, 64, or 57·1 per cent., were attacked, and 24, or 21·4 per cent., died. Of 606 vaccinated children, 18, or 2·9 per cent., were attacked, and 1 (said to have been vaccinated, but presenting no trace of marks), or 0·16 per cent., died. Of 57 unvaccinated children 33, or 57·8 per cent., were attacked, and 13, or 22·8 per cent., died. Of 1,707 vaccinated persons over 10 years of age, 463, or 27·1 per cent., were attacked, and 31 (including one whose vaccination was doubtful), or 1·8 per cent., died. Of 55 unvaccinated persons over 10 years of age, 31, or 56·3 per cent., were attacked, and 11, or 20 per cent., died.

It will be seen that the differences between these figures are very wide indeed, and not merely fractions or units. The inference to be drawn is irresistible.

Further, Dr. Gornall records that of 824 persons in the military barracks none caught the disease. No case occurred amongst the 117 revaccinated persons in the postal service, nor in the police force, whose members were all revaccinated. Nor did any case occur amongst the 23 nurses, etc., who were exposed to contact with small-pox in the discharge of their duties at the local small-pox hospital.

Small-Pox in Halifax.

In Halifax the antivaccinators have, during the last five years or so, acquired an ascendency on the board of guardians, with the unfortunate result that the Vaccination Acts have become almost a dead letter in the town. In 1891 only 516 out of the 4,868 children born were vaccinated. It must be borne in mind, however, that although this shows that children in increasing numbers are growing up unprotected against small-pox, the present adult population is still fairly protected. Let us hope the local experiences of small-pox in 1892 and 1893 may have opened the eyes of some at least of those who have been deluded by the sophistries of the opponents of vaccination. In the course of eighteen months 513 cases of small-pox were admitted to the Halifax Fever Hospital and 44 (8·5 per cent.)

died. Of these 425 were vaccinated and only 8 of them (or 1·8 per cent.) died. The remaining 88 were unvaccinated and 36 (or 40·9 per cent.) of them died. Looking more closely at the figures, we find that there were no vaccinated cases whatever under 5 years of age, but that 50 unvaccinated children under that age were attacked, and 20 (or 40 per cent.) of them died. Between 5 and 10 years of age there were 4 vaccinated cases, all mild and non-fatal, whilst there were 17 unvaccinated cases of that age, 9 of them confluent and 2 fatal. Above 10 years of age there were 421 vaccinated cases, 325 of them being "discrete" or mild, 96 of them "semiconfluent" or "confluent," or severe, and only 8 (or 1·8 per cent.) of them fatal; whilst of the 21 unvaccinated cases above 10 all were severe, and 14 (or 66 per cent.) were fatal. Two revaccinated persons were attacked, but in one of them the revaccination had taken place thirty-four years previously, and in the other the revaccination had been inefficiently performed five years previously. Of the hospital officials 1 only was attacked, and that during the first week of the epidemic before revaccination. All the others were revaccinated, and all escaped small-pox.

Oldham.

Oldham is the centre of antivaccination. In fact, it may be said that at present the Vaccination Acts are a dead letter in the town. Although the good people of Oldham may possibly not profit by their striking experiences of small-pox in 1893, yet it is worth putting the facts on record for the benefit of others who are still amenable to reason in this matter. It will be seen from the table that between January, 1892, and June, 1893, 605 cases of small-pox were treated in the Westhulme Hospital, the cases coming from Oldham, Chadderton, and Royton. Of these, 15 were vaccinated children under 10 years of age and all recovered; 97 were unvaccinated children under 10, and 27 (or 27·8 per cent.) died; 431 were vaccinated adults, and of these 19 (or 4·4 per cent.) died, whilst 51 were unvaccinated adults, of whom 14 (or 27·4 per cent.) died.

In a very careful and comprehensive report on this outbreak, Dr. Niven, then medical officer of health, showed that he did

his best to promote vaccination and revaccination, and that in the case of actually invaded families he was fairly successful. His report goes to show that efficient vaccination or revaccination immediately after exposure to the infection of small-pox (especially within three days after the appearance of the eruption in the patient first attacked) reduces, practically to a minimum, the risk of subsequent development of the disease in the individuals who have been exposed to it.

Small-Pox at Hastings.

An outbreak of small-pox, which occurred in the Hastings registration district early in 1894, has been closely investigated by Dr. Bruce Low, of the Medical Department of the Local Government Board, and the facts and figures set out in his report are very instructive. Between January and June, 1894, there occurred 86 cases of small-pox, of which 9 were fatal. In 7 of these cases it was not found possible to obtain definite information as regards vaccination. Two of them died, and neither examination of their arms nor questioning could obtain information, whilst no relatives were found. As to the other 5 non-fatal doubtfully vaccinated cases, there were no visible marks or scars on their arms, nor were the patients themselves or their friends able to give definite information as to vaccination. Of the remaining 79 cases, 67 were vaccinated, and 3 of them (or 4·4 per cent.) died; whilst 12 were unvaccinated, and of these, 4 (or 33·3 per cent.) died. Of the 67 vaccinated, only 4 (all mild and non-fatal) were under 10 years of age. Of these 4, one was an infant whose mother was attacked with small-pox three weeks after her confinement. She was removed to hospital, and her baby, after having been vaccinated, was sent with her. On the twelfth day after admission the infant developed "eight spots," but suffered little or no constitutional disturbance, and made a rapid recovery with no trace or mark of the illness. The mother, on the other hand, who had no visible vaccination scars, and who did not know whether or not she had ever been vaccinated, had a severe confluent attack. The three other vaccinated children attacked were: (1) a child, aged 3, with three vaccination scars, who had only "six spots"; (2) a child,

aged 2, with two vaccination scars, who had "one spot," there being three other small-pox cases at the time in the family; and (3) a child, aged 4, with three vaccination scars, who had only "a few spots," although his father, mother, and sister, had small-pox at the same time. In all three of these children the illness was of a trivial kind. On the other hand 10 unvaccinated children under 10 were attacked, and 4 (or 40 per cent.) of them died.

Further, as regards severity of attack, 56 of the vaccinated cases were mild and only 11 severe; but of the unvaccinated cases, only 4 were mild, whilst 9 were severe.

Blackburn Quarantines.

Blackburn furnished some instructive lessons from its visitation by small-pox in 1893. Out of 79 cases, 3 were vaccinated children under 10 who had mild attacks and recovered, and one a child whom the health officer states was unvaccinated and who died. Of the 75 cases over 10 years of age, 68 had been vaccinated, and only 2 died, 4 were unvaccinated and 3 of them died, whilst in the remaining 3 cases there was no evidence of vaccination, and 2 of these died. Vaccination was also noticed to influence very materially the fatality of the disease in those attacked. Thus, of 33 vaccinated patients showing 3 or more vaccination marks not one died. Again, the protection afforded by revaccination after exposure to infection was noticeable. There were 243 persons detained in quarantine for 14 days in consequence of their having been exposed to infection. Of these, 211 were revaccinated, 15 were already sufficiently protected by revaccination or a previous attack, and 17 were not revaccinated. Of the 211 revaccinated, 2 caught the disease, one having been exposed 4 days and the other 5 days before the performance of revaccination. Of the 17 persons who were not revaccinated 5 caught the disease. This surely goes to show that if only vaccination and revaccination were efficiently and judiciously carried out, the great expense and restriction of individual liberty involved in these "quarantines" could be avoided. Here are a couple of particular examples. A case of small-pox occurred in a house where there were 4 other persons.

Three of these were revaccinated and escaped, the fourth refused and was attacked. In another instance small-pox occurred in a house where there were three other persons. These were revaccinated and escaped. The only other person who had been in contact was a brother who lived in another part of the town. He was only in this house a few minutes. He was not revaccinated, and he was attacked by small-pox 12 days afterwards. Dr. Wheatley, the medical officer of health, was often much struck, when attempting to persuade the inmates of common lodging-houses to be revaccinated, by the large number of them who had been revaccinated previously. Many of them had been revaccinated in the army or navy, and others in public institutions. It is to this large amount of revaccination that he attributes the fact that small-pox did not spread in the lodging-houses to a greater extent than it did.

Small-pox in Bolton and Derby.

Of the 44 cases of small-pox which occurred in Bolton during 1893, 1 fatal case in a vaccinated child under 10 years of age is recorded in the table already given, but the medical officer of health explains in his report that he has doubt as to its having been small-pox at all. Of the 30 cases amongst vaccinated adults, all of whom recovered, it is instructive to find that 29 were "discrete," and that only 1 was of the "confluent" type. All the unvaccinated cases were severe.

Of the 46 cases of small-pox in Derby during 1893, 14 showed no marks of vaccination, 5 showed only one mark each (good in 4 instances), 11 showed two marks each (good in only 4 cases), 8 had three marks each (good in 6 cases), and 7 had four marks each (good in 5 cases); so that only 11 of the persons who suffered from small-pox were properly vaccinated. Of the 14 patients showing no marks of vaccination, 5 died, or 35·7 per cent. Of the remaining 32 patients who had been vaccinated, only 2 died, or 6·2 per cent., and both had been vaccinated imperfectly—one in one place only and the other in two places only. No patient was admitted to the hospital who had ever been revaccinated. The whole of the staff connected with the hospital had been revaccinated, and not one of them was attacked with the disease.

Striking Illustrations from Huddersfield, etc.

Huddersfield in 1893 had 48 cases of small-pox, and though that number is comparatively small, it teaches, when analysed, the same lessons as the more serious outbreaks. Forty-six of the cases were amongst persons over 20 years of age, and the remaining 2 cases were under 12 years of age, one being a child of 5, unvaccinated and the daughter of an antivaccinator, who very wisely had the rest of his family vaccinated, the other being a boy of 12 practically unvaccinated, because, although subjected to the operation in infancy, "the vaccination did not take." Dr. Kaye, the medical officer of health, also reports that the severity of the attack, with its attendant disfigurement by pitting, and consequent detention in the hospital, was roughly in proportion to the condition of vaccination exhibited by the marks on the patient. These facts were observed and acknowledged by the patients themselves. Twelve of the patients were unvaccinated, and only 2 deaths occurred amongst them. Dr. Kaye includes in his report an illustration, reproduced from a photograph, of one of these fatal cases, a child 18 months old, and he justly remarks that "if any convincible antivaccinationist could have witnessed the horrible condition of both these fatal cases—features swollen beyond recognition, and covered from head to foot with loathsome-smelling scabs, and totally incapable of doing anything for themselves—I do think he would have seriously reconsidered his position." Dr. Kaye also gives illustrations of two unvaccinated adults of 24, one on the ninth and the other on the tenth day of eruption, and by way of contrast an illustration of an adult of 34, having three vaccination marks, and only a few scattered small-pox spots. The striking contrast is just what is observed in every epidemic and every small-pox hospital. Dr. Kaye has approximately calculated that the unvaccinated constitute about 3 per cent. of the population of the borough, or say, 2,955, whilst the remaining 95,600 may be taken as more or less efficiently vaccinated. If vaccination possessed no preventive influence the incidence of small-pox would be the same amongst the vaccinated and the unvaccinated, and there should not be more than 1 unvaccinated case to every 33 vaccinated. In Huddersfield, however, the

proportion in 1893 was 1 unvaccinated case to 3 vaccinated cases.

Seventy-two cases of small-pox occurred in Keighley in 1893, 31 of them being vaccinated, and 41 unvaccinated, but only 1 of the former died, whilst 6 of the latter were fatal. Only 1 vaccinated child under 10 years was attacked, the disease being of a mild type; whilst 24 unvaccinated children under 10 were attacked, 17 of them having the disease in a "confluent" form, and 4 of them dying. Of the 40 "confluent" or "semi-confluent" cases, 33 were unvaccinated, and only 7 vaccinated, 4 of the latter being "semi-confluent." In the vaccinated the average duration of the illness was 36 days, in the unvaccinated it was 53 days.

In Ossett there occurred 41 cases of small-pox in vaccinated persons and 4 in unvaccinated during the two years 1892 and 1893. All of the former (except one who committed suicide) recovered, but one of the latter cases was fatal. The health officer adds in his report that during the last 13 years there have been 116 cases of small-pox in the district, 104 having been vaccinated in infancy (including doubtful cases), and 12 having never been vaccinated. Only 5 deaths have taken place, and all of them have been in unvaccinated subjects. There has been no instance there of a revaccinated person having contracted small-pox.

Salford had 174 small-pox cases during 1893, and 21 proved fatal. Of children under 10 years of age 7 who had been vaccinated caught the disease, but none died; whereas of 20 unvaccinated children, 7 died. Amongst vaccinated adults over 10 years of age there were 125 attacks and 8 deaths; whilst amongst the unvaccinated there were 17 attacks and 5 deaths. As regards the hospital staff, Mr. Mullen, the medical superintendent, reports that "with a very few exceptions the nursing staff of the Ladywell Sanatorium, all of whom had been successfully revaccinated, were afforded the opportunity of adding to their experience by being detailed in turn for attendance on small-pox cases. Not one of the staff contracted the disease."

Of 152 cases of small-pox treated in the Southampton Fever Hospital during 1893, 116 had been vaccinated and none

proved fatal; whilst out of 15 unvaccinated persons 7 died, and out of 21 patients whose previous vaccination was uncertain 1 died. One case, recorded by Dr. Harris, the medical officer of health, admirably illustrates the influence of vaccination. Two constables had occasion to visit a house in which a boy was suffering from small-pox, although the nature of the illness was not discovered until after their visit. On finding they had made this visit, Dr. Harris immediately inquired for the men at headquarters, and informed the inspector that they should be immediately revaccinated, offering at the same time himself to perform the operation if the men would come to his house. When they came he could persuade only one to accept the proposal, with the result that that one escaped, while the other, who refused, was admitted to hospital a fortnight later with severe "confluent" small-pox, from which he nearly lost his life.

Out of hundreds of persons who were revaccinated during the outbreak, only 2 contracted the disease, and in them it assumed a mild form. All persons employed at the hospital were revaccinated before commencing duty, and in no instance did a member of the staff contract small-pox in spite of their daily close contact with the disease.

Of the 23 cases of small-pox in Swansea in 1893, 22 had been vaccinated and recovered, whilst the only unvaccinated person died. As an instance of the protection afforded by vaccination, Dr. E. Davies, the medical officer of health, reports that the wife of one of the patients contracted small-pox, and was removed to the hospital with an infant child 4 months old, which was vaccinated just before the mother sickened of the disease. In the hospital this child occupied the same bed as the mother during her illness, but did not contract the disease.

Facts from Birmingham, Walsall, etc.

Birmingham has lately been suffering from small-pox, and at the time of writing the epidemic has not entirely subsided. But in his *Annual Report* for 1893 Dr. Alfred Hill gives an interesting account of the epidemic so far as that year is concerned. Of 979 cases 847 had been vaccinated, and 105 had

not, whilst in 27 cases previous vaccination was doubtful, no scars being visible. Of the 847 vaccinated patients at all ages 38 (or 4·5 per cent.) died, either during the year or after its close, most of them having less than 3 scars, and having therefore been very imperfectly vaccinated, whilst of the 105 unvaccinated 32 (or 30·5 per cent.) died. No case of small-pox occurred amongst the large number of vaccinated infants (under 1 year) in the town, but 14 occurred amongst the small number of infants who were unvaccinated. Only 6 vaccinated children between 1 and 5 years old were attacked, as compared with 21 unvaccinated, in spite of the fact that the vaccinated must be quite five times as numerous as the unvaccinated. Again, no death of a vaccinated person under 15 years of age occurred, but 20 unvaccinated persons under that age died. Then as regards the length of stay in hospital, the vaccinated patients were far better off than their unvaccinated fellows. Taking all the patients treated in the City Small-pox Hospital during the first eleven months of the year, the following instructive facts were observed:

	Average Number of Days in Hospital.
All vaccinated cases	30
Cases with 1 mark	34
„ 2 marks	33½
„ 3 „	29¼
„ 4 „	28
„ 5 „	26½
Unvaccinated cases	50

Thus the average duration of the illness in persons who had been vaccinated was about three weeks less than in those who were unvaccinated.

Yet one further fact. Over 100 persons were engaged on the staff of the small-pox hospital, all of whom had been recently revaccinated. Not one of them contracted small-pox. Could stronger evidence be forthcoming?

In 1893 Walsall was the seat of a severe epidemic, there being 778 cases, of which 71 (or 9·1 per cent.) died. Only two of 123 vaccinated children under 15 years who were attacked died, and one of these died not of small-pox, but of pneumonia; whilst out of 141 unvaccinated children under 15 attacked, as many as 41 (or 29 per cent.) died. Of adults

above 15 years of age, 431 vaccinated were attacked but only 4 (or 0·9 per cent.) died; whilst of 66 unvaccinated, as many as 20 (or 30·3 per cent.) died. "No case of small-pox," as Dr. J. Scott Wilson, the medical officer of health, reports, "was admitted to the hospital in which the patient had been recently revaccinated."

In his annual report for 1893 on the Bingley Local Board District, Dr. G. R. McGregor thus refers to the question of small-pox and vaccination: "Experience of vaccination, more especially of revaccination, has clearly proved its marvellous efficacy, both in the prevention and the mitigation of small-pox; and to such an extent has successful revaccination impressed itself upon me, that I have no fear myself personally of the closest possible contact with the most malignant cases of small-pox, and I have no fear whatever in advising persons so successfully revaccinated to have the most intimate contact with even the more virulent cases of small-pox."

In the Ecclesall Bierlow rural sanitary district, towards the close of 1893, small-pox broke out at Totley amongst a colony of navvies, and before it died out in July of that year, 222 cases and 19 deaths had occurred; 130 of these cases had been vaccinated and none of them died; in 19 other cases the fact of previous vaccination was doubtful, and amongst these there were 3 deaths; whilst the remaining 73 patients were unvaccinated, and 16 (or 19·1 per cent.) of them died. Of the 3 deaths in the doubtful class, one was said to have been vaccinated in infancy but had no visible marks; a second had a single doubtful mark; the third died rapidly of hæmorrhagic small-pox, the medical man in attendance being unable to ascertain his condition as to vaccination. So far as Dr. Gale, the local health officer, could ascertain, no person was attacked who had undergone successful revaccination, and he adds that "from beginning to end the epidemic was an example of neglected vaccination."

One Taken; the other Left.

As an illustration of the certainty with which small-pox singles out the unvaccinated, Dr. Gale records the following

particulars of an outbreak in a family at Green Oak : Father, vaccinated in infancy, not attacked ; mother, vaccinated and revaccinated, not attacked ; S., aged 17, unvaccinated, severe small-pox, recovered ; W., aged 13, unvaccinated, severe small-pox, recovered ; A., aged 11, unvaccinated, severe small-pox, died ; E., aged 10, unvaccinated, severe small-pox, died ; J., aged 8, vaccinated and revaccinated, not attacked ; C., aged 6, vaccinated six days before the first symptoms of the disease too late to give protection, severe small-pox, recovered ; N., aged 4, vaccinated, not attacked ; G., aged 2, vaccinated, not attacked.

As showing the protection afforded by vaccination even after exposure to the disease, the following facts are instructive. An unvaccinated child was attacked with small-pox in a house in Totley Rise. The mother immediately brought her three other children to the vaccination station, where they were successfully vaccinated ; and although they continued to reside with their ailing sister, not one of them was attacked. In April an unvaccinated boy living in Chesterfield Road was attacked ; he was the son of a strong opponent of vaccination, who had been prosecuted under the Vaccination Acts. His unvaccinated sister and father afterwards developed the disease. A fourth case occurred in the same house in the person of an infant vaccinated eight days before the first symptoms of the disease showed itself. The vaccination had the effect of modifying the eruption, but was too late to prevent it altogether.

Of 16 cases of small-pox which came under the immediate notice of Dr. Vann, the medical officer of health for Durham City, during 1893, 10 were vaccinated, 6 were unvaccinated, and none were revaccinated. Of the 10 vaccinated cases 6 were very mild, 2 were mild, and 2 severe, one of the latter being a man aged 31, in whom small-pox was complicated with other disorders, and who ultimately died. The number of vaccination marks in this patient was doubtful. On the other hand, 4 of the 6 unvaccinated cases were very severe, 3 of them dying. Two were severe, and in no case was the disease mild.

In Idle, near Bradford, in 1893, there were 10 cases of small-

pox. Four of them were unvaccinated persons, and each one had the disease severely; the other 6 were mild cases.

In Leeds, in 1892, 125 cases of small-pox came to the knowledge of Dr. Spottiswoode Cameron, the health officer, and were removed to hospital. Of these, 111 were said to have been vaccinated, although in a large proportion of them the vaccination had been very imperfect; 13 had never been vaccinated, and respecting 1 there was no record. Of the 111 vaccinated 2 (or 1·8 per cent.) died, both being upwards of 37 years of age; whilst of the 13 unvaccinated 4 (or 30·7 per cent.) died, 2 of them being more than 26 and 2 being children aged 3 months and 4 years respectively.

To the same effect was the experience of Leeds in 1893. There were 586 cases of small-pox and 30 (or 5·1 per cent.) of them died. Of these, 257 were "well vaccinated" cases and all recovered, only 3 of them being of the confluent or severe type; 241 others were "imperfectly vaccinated," and 13 (or 5·3 per cent.) of them died; 42 were said to have been vaccinated but showed no sign or mark, and of these 4 (or 9·5 per cent.) died; whilst 46 cases were "unvaccinated," and of these 13 (or 28·2 per cent.) died.

In the Newport Pagnell rural district during 1893, 8 cases of small-pox occurred, 6 of them originating in the following manner. A young man, tramping from Yorkshire, caught the disease whilst sleeping at a lodging-house in Leicester. It developed soon after his arrival at his father's cottage, with the result that he, his father, mother, brother, and a young child were shut up together in a cottage with only two bedrooms. The father, mother, and brother caught the disease, and the father, who was an elderly man and had never been vaccinated, died. The mother, an elderly woman, believed she had been vaccinated, but showed no signs of it; she recovered. The two young men had been vaccinated in infancy, and the attacks were mild, especially in the case of one, who did not feel ill enough to go to bed. The child, who had recently been vaccinated, did not take the disease, although shut up with the rest of the family. On another occasion, a man who had been tramping about the country arrived at a lodging-house at Fenny Stratford ill with small-pox. He was kept there during the

period of infection, and the other lodgers were quarantined at the expense of the sanitary authority for twelve days, and revaccinated. No other cases occurred. The man had been vaccinated in infancy and recovered.

In Oldbury 138 small-pox cases and 4 deaths occurred in 1893. Of these, 125 were vaccinated, and only 1 (or 0·8 per cent.) died, death in that case being really attributable to pneumonia, and not small-pox. Out of 11 unvaccinated cases 3 were fatal, 1 being a child aged 6 months, who died one mass of pustules on the eighth day after first appearance of rash, and the other 2 being children aged 3 and 4 months respectively. Two revaccinated persons caught the disease, but had it very mildly; in one of the cases the revaccination had been performed ten years previously, and in the other case the patient, who had already been exposed to direct infection by her two sons, took small-pox on the third day after attempted revaccination, but had the disease so mildly that less than a dozen abortive papules made their appearance. The patient was discharged as recovered within ten days. Dr. Cunningham, the health officer, mentions that of all those persons who sought revaccination during the small-pox prevalence, not one contracted the disease, although some are known to have been afterwards in actual contact with infection.

Facts from Pontefract, St. Helens, West Ham, etc.

In Pontefract in 1893 there were 58 cases of small-pox, and the local medical officer of health reports of them that "those who had been well vaccinated had the disease in a mild form, and those who were imperfectly vaccinated, or not at all, had it more or less severely. The two deaths occurred as usual in persons who had not been vaccinated (one was a chronic sufferer from bronchitis). Four cases were noticed of the small-pox and revaccination running concurrently, 1 taking small-pox ten days and the other 3 eleven days after revaccination, showing that the small-pox poison was already in the blood before revaccination. Both cases were of a very mild character, modified, no doubt, by the revaccination. No revaccinated person took the disease. The majority of the cases had only two vaccination scars. There were only 2 cases under 5 years, both unvaccinated

or showing no scars. Seven cases over 5 years were found unvaccinated, and, with one exception, all the cases had the disease in a severe form."

During the year 1893, 44 cases of small-pox occurred in the town of St. Helens, Lancashire, and 5 of them proved fatal. Not having the ages of these patients, I have not been able to distribute them in the tabular statement, but from the annual report of Dr. McNicoll, the health officer of the town, I quote the following: "In all, 44 cases occurred in 1893 with 5 deaths, and, as in 1892, no one who saw the cases and who had to take the responsibility of checking the spread of small-pox, could fail to notice the great value of 'efficient' vaccination and revaccination. No case of small-pox occurred in any of the members of the hospital or sanitary staff. Of the 5 persons who died, 3 were unvaccinated, in 1 the vaccination marks could not be seen on account of the 'confluent' nature of the pox, and no history could be obtained that vaccination marks ever existed. In the fifth case there was a history of vaccination, but no marks visible. Of the 38 persons who recovered, all had history of having been vaccinated. One man, aged 30, had been revaccinated at the age of 12 years. He had, however, only faint cicatrices existing. His attack was a mild one. In 17 other cases the vaccination cicatrices were very feebly present, while in the remaining 11 they were fairly marked."

Between January, 1893, and June, 1894, 935 cases of small-pox occurred in the borough of West Ham, and 103 (that is, 11 per cent) terminated fatally. Of these cases, 613 were treated in the Borough Small-pox Hospital together with 94 from outside districts, and the experience of Dr. Moir, the medical superintendent of that institution, as shown in the subjoined table, is very instructive as regards the influence of vaccination, though similar to that of others:—

Condition as to Vaccination.	Percentage of Deaths.
Unvaccinated	35·00 per cent.
Said to have been vaccinated, but with no mark	23·57 ,,
Imperfectly vaccinated	11·00 ,,
Showing good marks	4·10 ,,
,, 2 ,,	2·50 ,,
,, 3 ,,	1·90 ,,
,, 4 ,,	0·55 ,,
Revaccinated	0·00 ,,

Whittington, in Derbyshire, suffered from a sharp outburst of small-pox in 1893 and the early months of last year, there being 135 attacks and 13 deaths. I am unable to distribute these figures according to ages in the general statement, but the following little table, prepared by Dr. Barwise, the county health officer, and Mr. A. M. Palmer, the local medical officer of health, is very instructive :—

SMALL-POX IN WHITTINGTON DURING 1893 AND FIRST QUARTER OF 1894.

Age Period.	Number of Persons in Invaded Houses.	Attacks.	Vaccinated in Infancy.			Not Vaccinated.		
			Not Attacked.	Attacked.	Died.	Not Attacked.	Attacked.	Died.
Under 10 years . . .	177	25	148	11	0	4	14	5
10 to 20 years	111	34	77	31	0	—	3	1
20 to 30 „	85	37	48	35	2	—	2	0
30 years and upwards . .	109	39	70	39	5	—	—	—
Totals	482	135	343	116	7	4	19	6

Therefore, of 459 persons vaccinated in infancy and living in houses invaded with small-pox, 25 per cent. were attacked and 1·5 per cent. died; whilst of 23 persons unvaccinated and in invaded houses, 82·7 per cent. were attacked, and 26 per cent. died. No vaccinated person under 20 years of age died.

III.

IN the town of Willenhall, with 16,000 inhabitants, there occurred between March and July of 1894, 501 cases of small-pox, 30 in children under 5 years of age, and 471 in persons above that age. Of the 30 children, 24 had never been vaccinated, and of these 7 died. Nearly all these 24 cases were very severe, and in the survivors the illness will be followed by permanent disfigurement. Of the remaining 6 cases, 5 had been vaccinated, but in only one instance with any approach to

efficiency. All these 5 cases were very mild, and will not be followed by permanent disfigurement. The remaining one of these 6 cases was only vaccinated a few days before the diseaso broke out, and the attack was a mild one. In considering these figures, it should be borne in mind that there cannot be fewer than 2,000 children in the town less than 5 years old, the bulk of whom are known to be more or less efficiently vaccinated. Of the 22 persons who died from small-pox at all ages, 10 had never been vaccinated; it is doubtful whether 2 others had been, whilst only 3 had four vaccination scars. None had been revaccinated. Dr. Hartill, the medical officer of health, in reporting these facts, deplored the dissemination of doctrines which have led to a growing neglect of vaccination in Willenhall. "Speaking," he adds, "with the knowledge acquired by an experience which only falls to the lot of a few, I can say revaccinated persons are almost proof against contracting small-pox, and for practical purposes I believe them to be quite proof against contracting it in a severe form."

The most recent small-pox scare in London, that which occurred in July, 1894, in the Portland Town district of the parish of St. Marylebone, supplies just the same evidence in favour of vaccination as that provided elsewhere throughout the whole country. Here is an extract from the report of Mr. E. C. Greenwood, the public vaccinator of the parish: "I have from time to time visited the small-pox hospital ships to ascertain the effect of the disease on those vaccinated and those unvaccinated. There have been up to the present (that is, September 23rd, 1894), 224 cases from St. Marylebone. Of these, 91 were unvaccinated, and 133 vaccinated (of the 133 vaccinated, it is only right to say that a third were but imperfectly vaccinated). Of the unvaccinated there were 22 under 5 years of age, of which 15 were severe, and 7 mild; over 5 years, and under 15, 46 cases, of which 33 were severe, and 13 mild; over 15 years, 23 cases, of which 18 were severe, and 5 mild. Of the 133 vaccinated, none were under 5 years of age, 16 were over 5 years and under 15 years, and there were only 3 severe cases; over 15 years there were 112 cases, 31 being severe and 81 mild. There have been only 5 cases admitted into the hospitals of persons who have been revaccinated, all of whom

had the disease very slightly, with the exception of 1 who suffered from chronic alcoholism and bronchitis, and ultimately died. There have been in all 19 deaths: of these, 14 occurred in unvaccinated people, and 5 in vaccinated, all the latter being over 23 years of age.

"The effect of vaccination upon the disease is also clearly shown by the length of stay in hospital. From the statistics which I have been able up to the present to get I find the average stay of the unvaccinated is 35 days, and that of the vaccinated 25 days. It is interesting to note that there has been only one case of small-pox occurring amongst all those who have been vaccinated or revaccinated during the epidemic. This one case was that a child of 1½ year of age, who had contracted the disease previous to being vaccinated; the vaccination, however, was beneficial in considerably modifying the attack.

Immunity of Doctors, Nurses, etc., in Small-Pox Hospitals.

Undoubtedly one of the most powerful and unanswerable arguments in favour of the usefulness of efficient vaccination and revaccination is the comparative immunity of the vaccinated and revaccinated doctors, nurses, and others employed generally in and around small-pox hospitals. This convincing phenomenon has long been established, but fresh evidence on the point is daily coming to hand. Writing on the subject in *Quain's Dictionary of Medicine*, Dr. Collie, who for many years was superintendent of one of the hospitals of the Metropolitan Asylums Board, says: "During the epidemic of 1871, 110 persons were engaged in the Homerton Fever Hospital in attendance upon the small-pox sick; all these, with 2 exceptions, were revaccinated, and all but these exceptions escaped small-pox. The experience of the epidemic of 1876–77 was of the same kind, all revaccinated attendants having escaped, whilst the only one who had not been revaccinated took the disease and died of it. So, in the epidemic of 1881, of 90 nurses and other attendants on the Atlas Hospital Ship (small-pox), the only person who contracted small-pox was a housemaid who had not been revaccinated."

Not long ago a Vaccination Committee of the Epidemiological Society independently reinvestigated this subject, confining its attention to those "in personal attendance on cases of small-pox," with the result that, out of 1,500 such attendants, only 43 were found to have contracted small-pox, "and not one of these 43 had been revaccinated." *

The Highgate Small-Pox and Vaccination Hospital furnishes some very direct evidence on this point, in respect of a lengthened period. In a letter to a friend, dated May 9th, 1893, the late Dr. Herbert Goude, who was at that time medical officer of the institution, remarked that "the statement I made in 1885 that no nurse or other official of this hospital had contracted small-pox, with one exception—that of a gardener who escaped revaccination—holds good to the present date, so that now we have an unbroken record of 58 years, during which no nurse or servant has contracted the disease, even in a modified form; and this too, though the nurses and attendants on the sick have on many occasions accidentally inoculated themselves with variolous matter, thus putting the protection afforded by vaccination to a really crucial test. We have had no injurious effects from revaccination beyond those apparently inseparable from the operation, such as *malaise* and occasional tardy healing of the vesicles."

Further, on turning to the reports of the Metropolitan Asylums Board for 1892, we find a summary by Dr. T. F. Ricketts, the Medical Superintendent of the Small-Pox Hospital Ships, showing that out of 1,201 persons who had been engaged on board the ships since 1884, and who had therefore been exposed to the infection of small-pox, only 6 contracted the disease, and all recovered. One of these cases was a stoker who had become infected before joining the staff; 2 of the others were vaccinated unsuccessfully on the day of joining only; another was vaccinated unsuccessfully on the day after joining the staff, and with partial success a week later, with the result that her attack of small-pox consisted of "a few spots" only; another of the cases was vaccinated, after joining, on three occasions unsuccessfully; and the sixth case was a ward

* See *Transactions of the Epidemiological Society*, vol. v., new series.

maid who was vaccinated after joining on three occasions unsuccessfully, on the fourth trial successfully, but too late to prevent her being attacked by small-pox. Her attack was a "very mild discrete" one however. In Dr. Ricketts's report for 1893 we find that of the 307 persons employed on the hospital ships during the year, 6 contracted small-pox and all recovered. In one of these cases the disease developed three days after joining the hospital, showing that the infection had been contracted from an independent source. Of the other 5 cases, vaccination in 2 instances was altogether unsuccessful, and in 3 it was not successful until the third attempt; meanwhile the small-pox had laid hold of these imperfectly protected individuals, though the attacks were not severe or fatal in any case. During 1893 also 5 temporary workmen employed at the ships caught small-pox and recovered. Four of these men had foolishly evaded vaccination, whilst the fifth, whose attack was a mild one, had been vaccinated twice unsuccessfully. The failure to secure prompt success in the vaccination of these persons is extremely unfortunate, and is accounted for by Dr. Ricketts by the fact that stored lymph has necessarily to be relied upon at the ships.

It is to be hoped that this exposure of a serious flaw in the protective armour of the staff of the hospital ships has led to a revision and amendment of the arrangements in force. It is absolutely essential that attendants, before going on duty should be efficiently protected, either by vaccination or by a previous attack of small-pox. There should be no doubt in the matter.

To my mind all this goes to prove conclusively the great protective value of vaccination and revaccination. Here we have, between 1884 and 1892, some 1,195 officials of all sorts —doctors, nurses, and others—who have been efficiently protected by vaccination or by previous small-pox, living securely in an infected atmosphere, whilst the remaining 6 who have not been so protected are promptly attacked by the disease; and in 1893 we see 301 efficiently protected officials escape, whilst 6 unprotected of the same group are attacked.

How do these facts compare with those as to the attendants on other infectious fevers? Taking the year 1893, we find that of 2,484 persons employed in the 9 Metropolitan Fever

Hospitals, 130 became infected, and 2 died; 4 assistant medical officers, 10 nurses, 43 assistant nurses, and 16 ward servants were attacked by scarlet fever, 2 assistant medical officers, 6 nurses and 15 assistant nurses by diphtheria, 2 nurses and 3 assistant nurses by enteric fever, etc. Comment on this comparison is surely unnecessary.

Throughout the country the experience as to the immunity of properly revaccinated small-pox nurses, etc., is similar to that of London. At Leicester, where the authorities who laugh vaccination to scorn have been challenged unsuccessfully to complete their gigantic experiment by employing none but unvaccinated people as nurses and attendants at their small-pox hospitals, the influence of vaccination and revaccination in protecting the nurses from small-pox has been characteristically illustrated. During the epidemic of 1892-3 there were 40 officials connected with the Leicester Small-pox Hospital. Of these, 34 were efficiently protected, either by previous small-pox or by revaccination, and they all escaped small-pox. The remaining 6, however, were inefficiently protected; they refused to be revaccinated, and 5 of them caught the disease. The only inefficiently protected official who escaped was the matron, who, of course, was not much exposed to the contagium. Dr. Hill, of Birmingham, reports that during the epidemic there in 1893, over 100 persons were engaged on the staff of the City Small-pox Hospital, all of whom had been recently revaccinated. Not one of them contracted small-pox. In Derby the whole of the staff connected with the hospital had been revaccinated, and not one of them was attacked with small-pox. Not one of the 23 nurses, etc., at the Warrington Small-pox Hospital caught the disease during the epidemic of 1893. The same is the invariable and convincing experience at the hospitals at Sheffield, Halifax, and numerous other places of which information is available.

How is it, also, that the deaths of medical men from small-pox are only 13 per million as against 73 per million of the general population; whereas in scarlet fever, against which doctors have no special means of protection, there is the remarkable fact that 59 medical men per million die from that cause, as against 16 per million of the public? When

these facts are borne in mind, and accentuated by the remarkable immunity enjoyed in the presence of small-pox by the revaccinated postmen, policemen, soldiers, sailors, etc., the propriety of not only compulsory primary vaccination, but compulsory revaccination at puberty, is irresistibly forced upon us.

What is Efficient Vaccination?

A careful study of the recent statistics and comparison of them with the older figures teach a variety of lessons. The most obvious and important is that, allowing for the few exceptions which prove the rule, efficient vaccination in infancy affords an almost absolute immunity from small-pox up to about 10 years of age, but that after that age the operation needs to be efficiently repeated. Efficiency, however, is a *sine quâ non*. Mr. Alexander Wheeler (Q. 8,688, etc., before the Royal Commission) and his antivaccination friends wish to frame their arguments on the assumption that all vaccination—good, bad, and indifferent—must be regarded as equally protective, or rather unprotective, against small-pox. It would be scarcely less absurd to argue that the mere visit to a public vaccinator's surgery should be regarded as proper vaccination, or as sufficient treatment for a broken limb. In view of the lesson taught by a study of the foregoing evidence that a deplorably large proportion of the nominally vaccinated to-day have been most inefficiently vaccinated, and are consequently in many cases almost unprotected against an attack of small-pox, it cannot be too often repeated that efficiency in vaccination is of vital importance. Nothing has done so much to damage the cause of vaccination as the fact that, in consequence of inefficient vaccination, cases of post-vaccinal small-pox, modified though they be by the vaccination, occur in every epidemic. It has been clearly shown to all but the wilfully blind that when the operation has been efficiently performed in the first instance it seldom, if ever, loses altogether its protective property. But so long as medical men are found ready, in their mistaken good nature, to pander to the ignorance of applicants for vaccination, and make only one, or perhaps two, insignificant insertions of lymph in a child's

arm, and certify cases of that kind as successfully vaccinated, so long shall we have cases of small-pox occurring in vaccinated subjects, and shall have to struggle against the fallacies and sophistries of antivaccinators. Better let such applicants depart unvaccinated until they learn wisdom than place them in a state of false security, and at the same time endanger one of the greatest prophylactics of modern times.

What, then, is efficient vaccination? To secure it the official instructions of the Local Government Board prescribe that public vaccinators shall "in all ordinary cases of primary vaccination make such insertions of lymph as will produce at least four separate good-sized vesicles or groups of vesicles, not less than half an inch from one another. The total area of vesiculation on the same day in the week following the vaccination should not be less than half a square inch."

There is abundant evidence of the correctness of this instruction, and of the need for its observance as a minimum of efficiency. Between 1836 and 1867 the late Mr. Marson, who as Surgeon of the London Small-pox Hospital had exceptional opportunities of making reliable observations over an extended period, recorded the facts concerning 13,755 cases of small-pox. The results are shown in the following table, which was laid before the Royal Commission by Dr. Thorne Thorne:

MR. MARSON'S CASES.

13,755 Cases of Small-pox, Classified according to the Vaccination Marks borne by each Patient respectively.	Percentage of Deaths in Each Class respectively.	
	1836–51 (3,094 Cases).	1852–67. (10,661 Cases).
Stated to have been vaccinated, but having no cicatrix	21·7	39·4
Having 1 vaccine cicatrix	7·6	13·8
„ 2 vaccine cicatrices	4·3	7·7
„ 3 vaccine cicatrices	1·8	3·0
„ 4 or more vaccine cicatrices . .	0·7	0·9
Unvaccinated	35·5	34·9

To the same effect has been the experience of the hospitals of the Metropolitan Asylums Board and of every large town. The following table records the facts as regards 10,403 cases of small-

pox which came under the personal observation of Dr. W. Gayton whilst he was Medical Superintendent of the Homerton Small-pox Hospital and of the North-Western Fever Hospital of the Metropolitan Asylums Board. It was explained to the Royal Commission by Dr. Gayton himself:

DR. GAYTON'S 10,403 CASES.

Condition as to Vaccination.	Under 10 Years.			Over 10 Years.		
	Cases.	Deaths.	Per-centage.	Cases.	Deaths.	Per-centage.
Vaccinated, with good marks	267	2	0·75	1,818	60	3·3
Vaccinated, with imperfect marks	714	48	6·72	4,140	407	9·8
Said to have been vaccinated, but no visible marks . .	325	87	26·7	970	265	27·3
Not vaccinated . . .	1,187	563	47·4	982	375	38·2

Here is a classified summary of 2,361 cases of small-pox treated during 1893 in the Hospital Ships of the Metropolitan Asylums Board:

Character of Vaccination.	Cases of Small-Pox.		Totals.		
	Discrete.	Confluent.	Cases.	Deaths.	Percentage of Deaths to Cases.
Under 10 years of age:					
Having scars of ½ square in. total area .	21	0	21	0	—
,, ,, between ⅛ and ½ square in. area	12	2	14	0	—
,, ,, less than ⅛ square in. area .	19	0	19	0	—
,, ,, unrecorded area . . .	2	0	2	0	—
Over 10 years of age:					
Having scars of ½ square in. total area .	794	30	824	17	2·06
,, ,, between ⅛ and ½ square in. area	215	13	228	6	2·60
,, ,, less than ⅛ square in. area .	345	21	366	12	3·20
,, ,, unrecorded area . . .	128	12	140	7	5·00
Total vaccinated { Under 10 years . .	54	2	56	0	—
Total vaccinated { Over 10 years . . .	1,482	76	1,558	42	2·60
Evidence of vaccination inconclusive . . { Under 10 years .	10	9	19	6	31·50
Evidence of vaccination inconclusive . . { Over 10 years . .	173	58	231	38	16·00
No evidence of vaccination . { Under 10 years . .	217	65	282	63	22·30
No evidence of vaccination . { Over 10 years . . .	140	75	215	31	14·40

The following table shows the classification of 1,105 cases of small-pox treated in the Sheffield Borough Hospital in the epidemic of 1887–8, as recorded in Dr. Barry's report :

Character of Vaccination.	Cases of Small-Pox.				Totals.		
	Varioloid.	Discrete.	Coherent.	Confluent.	Cases.	Deaths.	Per-centage.
No visible cicatrix, or 1 only	19	47	25	4	95	13	13
Two primary cicatrices	73	132	50	4	259	24	9·3
Three primary cicatrices	149	193	27	3	372	21	5·7
Four or more primary cicatrices	52	41	5	1	99	2	2·0
Total vaccinated	293	413	107	12	825	60	7·2
Unvaccinated	0	50	175	55	280	93	33·2

The 590 cases of small-pox which occurred in Warrington in 1892–3 are classified in the following table :

Character of Vaccination.	Cases of Small-Pox.			Totals.		
	Discrete.	Confluent.	Haemor-rhagic.	Cases.	Deaths.	Per-centage.
Under 10 years of age :						
1 primary cicatrix	1	0	0	1	0	—
2 „ cicatrices	5	1	0	6	0	—
3 „ „	9	1	0	10	0	—
4 „ „	3	0	0	3	0	—
5 „ „	4	0	0	4	0	—
Said to have been vaccinated in infancy	0	1	0	1	1	—
Unvaccinated	7	25	1	33	13	39·3
Over 10 years of age :						
1 primary cicatrix	44	15	2	61	4	—
2 „ cicatrices	156	54	2	212	20	—
3 „ „	116	30	0	146	7	—
4 „ „	42	12	0	54	1	—
5 „ „	3	2	0	5	0	—
Said to have been vaccinated in infancy	18	3	0	21	1	—
Unvaccinated	6	25	2	33	13	39·3
Total vaccinated . Under 10	22	3	0	25	1	6·4
Total vaccinated . Over 10	379	116	4	499	33	6·4
Total unvaccinated Under 10	7	25	1	33	13	39·3
Total unvaccinated Over 10	6	25	2	33	13	39·3

From Bristol comes the evidence to be gathered from the following table:

Condition as to Vaccination.		Under 15 Years.			Over 15 Years.		
		Small-Pox Cases.	Deaths.	Per-centage.	Small-Pox Cases.	Deaths.	Per-centage.
Having 1 vaccination mark	1887–8	13	0	—	67	7	10·4
	1893	2	0	—	25	0	—
Having 2 vaccination marks	1887–8	19	0	—	78	1	1·2
	1893	5	0	—	33	4	12·1
Having 3 vaccination marks	1887–8	14	0	—	39	0	—
	1893	2	0	—	41	3	7·3
Having 4 or more vaccination marks	1887–8	18	0	—	24	3	12·5
	1893	3	0	—	27	1	3·7
Unvaccinated or doubtful	1887–8	22	12	54·5	33	14	42·2
	1893	15		10·0	11	5	45·4

Of 46 cases of small-pox treated in the Derby Borough Hospital in 1893, 14 had no marks of vaccination; 5 of these 14 died, and 3 others had the disease in a severe form. Of the remaining 32 vaccinated cases only 2 died, and these two had been vaccinated very imperfectly, one in one place only, and the other in two places. These two fatal cases were the only severe cases amongst the vaccinated.

These experiences could be multiplied indefinitely; but, if what has already been given does not carry conviction, it is to be feared that this result would not be secured by wearisome iteration. It is clear that there is vaccination *and* vaccination, and that the severity of an attack of small-pox is in proportion to the efficiency or otherwise of the original vaccination. Parents, ignorant but otherwise well-meaning towards their children, will always be found who first object to more than "one mark" on their child's arm, and who prefer to go to those doctors that will pander to their whim and "not hurt their babies." There are many such medical men in practice who are ready to fall in with this foolish request, on the ground that half protection will be better than none at all. But, in face of the experiences, of which a few have been referred to already, medical men will do well to refuse absolutely to perform anything but vaccination of the most efficient sort. If a firm,

united stand of that kind were made against the foolish prejudices of ignorant mothers, cases of post-vaccinal small-pox would be practically abolished amongst children, and would become much more rare amongst adults. Such a result could not fail to break down utterly the opposition to vaccination.

Mitigation of Small-Pox by Vaccination.

The influence of vaccination in mitigating the severity of an attack of small-pox is further shown in the records of the "pitting" or permanent disfigurement following the disease, and also of the length of stay of patients in hospital. Thus, in the recent Leicester outbreak we find, from Dr. Priestley's very full and precise report, that of 134 unvaccinated cases of small-pox that recovered, as many as 112 are more or less "pitted," most of them severely; whilst out of 177 vaccinated individuals who recovered, only 43 have any "pitting" whatever, and in only 4 cases is the "pitting" at all severe.

From Dr. Barry's report on the Sheffield epidemic of 1887–88 (page 190), we find that out of 451 vaccinated children under 10 years of age attacked by small-pox, only 24 showed any "pitting" on recovery, whilst Dr. Barry reports that "in nearly all the children of the unvaccinated class who were incidentally inspected in the course of the inquiry, the attack of small-pox was of a severe type, and in the majority of cases was followed by considerable 'pitting.'" The same experience has been furnished by the other epidemics of recent years.

As regards length of stay in hospital of the different cases, the experience of Leicester last year is that amongst children under 10 years of age the stay of the vaccinated was 14·5 days, and of the unvaccinated 47·3 days. Amongst persons over 10 years of age, the average stay was 28·6 days in the vaccinated, 14 days in those who had had small-pox previously, but as much as 44·2 days amongst the unvaccinated.

In Keighley the average duration of the illness was 36 days amongst the vaccinated, as compared with 53 days in the unvaccinated. Broadly speaking, this is the experience of every small-pox epidemic.

Again, in past times blindness has been a very common

result of small-pox, but happily vaccination has produced a marked improvement in this respect.

IV.

Sanitation in Relation to Small-Pox.

It will be useful to glance at some of the main arguments advanced by antivaccinators, in their struggles to explain away this accumulating mass of evidence. Those arguments, being oftentimes very plausible and arrived at by deliberate suppression of important considerations, have, unfortunately for the community, already misled a large number of worthy people who are not ready or perhaps able to make more than a superficial study of the subject, and who do not therefore see how many vital considerations are wilfully withheld from them by their antivaccination teachers. Thus we are seriously asked by Dr. A. R. Wallace and others to regard the fact that the small-pox mortality in this country has fallen enormously since the introduction of vaccination, as merely a "casual coincidence." The improved sanitation of modern times, the change for the better which has taken place in our habits as a nation, the introduction of a much larger supply of fresh vegetables and fruit, the extended "use of tea and coffee," the better drainage and more cleanliness; these and such-like beneficial influences are held up as the real enemies of small-pox. This is one of the trump cards played by the opponents of vaccination, but in playing it the remarkable and indisputable change which has taken place in the age incidence of small-pox is deliberately ignored. We have it on the Registrar-General's authority that whilst the general death-rate in this country has decreased 9 per cent., that of small-pox has fallen as much as 72 per cent. We also have it on the same authority that this decline in the small-pox mortality has been entirely limited to persons under 15 years of age, there being actually an increase at every age above 15 years. But how can such a marvellous change in the age incidence of the disease be, with any consistency, attributed to the improvement in sanitation by which all ages

alike are affected? We find no such changed incidence in the case of the "filth diseases," which long have been proved to be amenable to good hygiene. The decrease in the fever mortality, as we should naturally have expected, has been common to all age periods; it has not been restricted to children. Further, if we take those diseases—scarlet fever, measles, whooping-cough—which are favoured by conditions that favour small-pox, we find that, unlike small-pox, the share of the mortality which is borne by children is practically identically the same now as it was half a century ago. In the case of no other disease has there been such a lessened incidence on children at the vaccination age as in the case of small-pox.

Then, again, apart from vaccination, there is no reason why small-pox should be affected to a greater extent by sanitation than, say, measles or whooping-cough. Yet, during the same period that small-pox has declined 72 per cent., measles has only fallen 9 per cent., and whooping-cough little more than 1 per cent.

It is an undisputed truism that all insanitary unwholesome conditions, all circumstances which lower the vitality of the individual, operate for evil and retard the recovery of the sick, and in the case of those infections, such as small-pox and scarlet fever, which are aërially conveyed, overcrowding would specially tend to spread an epidemic. An instance of this is furnished by the report on the recent Walsall epidemic. But, beyond this, it is contrary to the experience of all competent observers throughout the world that small-pox should be affected by sanitary conditions.

Some very direct evidence on this point is to be found in some of the reports on recent outbreaks of small-pox. Thus, Dr. Ainley, the health officer of Halifax, reports that during the epidemic in that town in 1892-93, special record was kept of the sanitary condition of every house in which the disease occurred, with the result that 56·7 per cent. of the houses were in a cleanly condition, 29·4 per cent. were in a fair state, and only 11·1 per cent. were dirty; or, in other words, upwards of half of the invaded houses were clean and sanitary, nearly a third were very fair, and only a ninth were dirty.

Dr. Niven, again, reports that in Oldham, during the epidemic

of 1892, the disease mainly occurred amongst the better class of artisans, and singularly spared the worst parts of the town. That was, no doubt, in great measure an accident, for it was not so in the previous epidemic. But what occurred in 1892 shows the fallacy of the contention that small-pox is a "filth disease" in the true sense of that term. At Warrington "there is a great deal of bad property, dating from the period when the place was remarkable for the large population stowed away in a very small area, and was notoriously unhealthy." Yet it was observed, during the small-pox epidemic of 1892-93, that the disease showed no special prevalence in those parts. Further, out of 2,424 persons inhabiting 397 houses invaded by small-pox, 22·4 per cent. were attacked by the disease and 2·3 per cent. died. Of these persons 2,313 were vaccinated and 20·7 per cent. of them were attacked and 1·3 per cent. died; whilst of the remaining 112 unvaccinated, 57·1 per cent. were attacked and 21·4 per cent. died. Of 606 vaccinated children under 10, 2·9 per cent. were attacked and 0·16 per cent. died; whilst of 57 unvaccinated children under 10, 57·8 per cent. were attacked and 22·8 per cent. died. All this is quite inconsistent with the theory that sanitation governs the distribution of the disease. Here it is seen, that of a mixed population of vaccinated and unvaccinated in invaded houses in the same area, exposed to precisely the same sanitary conditions, the incidence of the disease was vastly heavier on the unvaccinated than upon the vaccinated.

Leicester on this point also furnishes evidence. A particular group of 54 houses had their drainage arrangements individually examined with the smoke test. Nine of these 54 houses had been invaded by small-pox, and although four of them showed some sanitary defects, 5 of them showed no defects. The remaining 45 were not invaded by small-pox, and yet 9 of these showed sanitary defects.

Objections to Division into "Vaccinated" and "Unvaccinated."

Another antivaccination argument, and one which has no more foundation than that just referred to, is that the separa-

tion of the vaccinated from the unvaccinated is not a fair separation; as, to use Dr. Wallace's description to the Royal Commission (Q. 7421), "the unvaccinated would be necessarily to a very large extent of the very lowest class, including the tramps and the criminal classes, and also children who were too delicate to be vaccinated, and children who got small-pox before they were vaccinated." Much the same point was urged by Mr. A. Wheeler, another leader amongst the antivaccinators. Referring to the difference in the mortality amongst the vaccinated and the unvaccinated, he said he "should expect the vaccinated to come off better in cases of small-pox than the unvaccinated." He "should be surprised if they did not, because they are a selected population; whereas the unvaccinated include the whole of the poor children who are rejected as unfit for vaccination, and they include all the postponed because not being totally unfit they are to a certain extent unfit, and those form a considerable portion of a minority of the population, of a small minority according to the Government account."

This is a very ingenious way of trying to account for a very remarkable set of facts; but what does it all amount to? If the unvaccinated are such a feeble, sickly lot, they ought to suffer from other infectious diseases than small-pox to a greater extent than the vaccinated. But no evidence of anything of the kind is forthcoming. When asked to furnish some evidence in support of his assertion, Mr. Wheeler bravely referred to the "Sheffield Report," and on being pressed further he "opened it at page 48." What does that page show? That out of 22 fatal cases of small-pox (20 of whom had never been vaccinated, 1 had been vaccinated only one day, and the other only five days before the appearance of the small-pox eruption), the previous health of 1 is recorded as "very good," of 12 as "good," and of only 5 as "delicate." In only 3 of the cases had ill-health been the cause of the neglect of vaccination. Six of the cases were under 1 year, and 7 others were under 10 years of age. The same kind of record is to be found on page after page of the Sheffield Report. On pp. 198 and 199, Dr. Barry has summarised the results of his personal inquiry with reference to the fatal cases of small-pox which occurred in

Sheffield during 1887 and the first three months of 1888. He there shows that out of 246 deaths among the vaccinated class, the previous health of the deceased was satisfactory in 129 instances, and unsatisfactory in 79 cases; whilst out of 343 deaths amongst the unvaccinated class, the previous health of the deceased was satisfactory in 210 cases, and unsatisfactory in only 77 cases. In only 52 of the 343 fatal unvaccinated cases had "ill-health" been given as the reason for the non-vaccination. It is needless to remark that if these facts are the kind upon which Mr. Wheeler's argument is based, it entirely falls to the ground.

Keller's "Celebrated" Statistics.

Dr. Wallace, in support of his assertion, appealed to "the celebrated statistics of Dr. Keller in Austria." Dr. Wallace was apparently not aware that those "celebrated" statistics had been exposed as false and partly fabricated, but such is the fact. These statistics related to some 60,000 officials and workmen employed on the Imperial Austrian State railways, and as set out by Keller they told strongly and strangely against vaccination; but the result was so extraordinary and so altogether contrary to all other experience, that Keller's figures were looked upon with suspicion. Other reliable inquirers went over the same ground, and got results totally different from those of Keller; and in 1887 Herr Körösi found that Keller had directly falsified the returns originally supplied to him by the various railway surgeons so as to serve his antivaccination ends, figures having been altered, such as 68 to 38. At the International Medical Congress at Washington in 1887, a committee was appointed to thoroughly examine Keller's statistics, and eventually reported that all the returns submitted to them were, without exception, "falsified in such a manner as to raise the mortality from small-pox amongst the vaccinated, while that of the unvaccinated was lessened." These statistics are certainly "celebrated," but in a sense very different from that which Dr. Wallace meant when he first so confidently referred to them.

Risks of Vaccination.

There remain to be considered the alleged risks connected with vaccination. The importance of this branch of the subject is obvious, and if half the contentions of the antivaccinators as to vaccination itself being the "cause of disease and death," could be maintained, there would be much justification for the position they have taken up. In that case, however, the crusade would be unnecessary, for the practice would not be countenanced by the medical profession. In the early days of the present century Jenner's opponents prophesied a fearful future for the vaccinated human race. One cannot read without amusement the wild predictions of these early prophets of evil, and their extravagant descriptions of the fairyland cases which they professed to have met with. In one instance, the face of a vaccinated boy was "in a state of transforming, and assuming the visage of a cow." In another, a child had its former natural disposition absolutely changed to the brutal, so that it ran upon all fours like a beast, bellowing like a cow; and so on from one absurdity to another. Later on diarrhœa, cholera, enteric fever, scarlet fever, puerperal fever, bronchitis, and one malady after another was laid at the door of vaccination, with usually no stronger proof than the fact that it occurred after the vaccination instead of before. Any marked increase of mortality from a disease was attributed to vaccination. The latter day antivaccinators, however, have dropped one disease after another out of their list of the maladies whose prevalence and mortality are alleged to be affected by vaccination, until at the present time the only diseases which need to be at all seriously considered in this connection are syphilis, cancer, and erysipelas.

The average mortality from syphilis in England during successive five-year periods, between 1850 and 1879, is given by Dr. Wallace as 37, 51, 64, 82, 81, 86 per million, and it is alleged that the rise here shown is attributable to vaccination. But without going deeper into the question, the fallacy of the contention is readily seen by a comparison of the statistics of Scotland and England. In Scotland, vaccination is not compulsory until 6 months of age; and yet, taking the three years 1882 to 1884, we find that in that country 43·8 per cent.

of the total deaths from syphilis were in children under 3 months of age, 21·3 per cent. between 3 and 6 months, and 11·6 per cent. between 6 and 12 months; that is to say, 65 per cent. of the deaths occurred before the expiration of the vaccination age. In England, on the other hand, 3 months is the limit after which vaccination is compulsory, and we should, therefore, expect to find a greater share of syphilis mortality in this country within that period, or at all events within 6 months of age, if vaccination had any influence on it. Yet, taking the same three years, we find the proportions practically identical with those of Scotland; 42 per cent. of the mortality occurred in children under 3 months, 22·5 per cent. in children between 3 and 6 months, and 11·3 per cent. between 6 and 12 months. As Sir Walter Foster stated during the last important debate on vaccination in the House of Commons on May 13th, 1893, the increase shown in recent years in the prevalence of infantile syphilis is a matter of improved diagnosis. Deaths from syphilitic diseases of the brain, liver, etc., are now diagnosed as syphilis, which twenty or thirty years ago were not so classed. The apparent increase of deaths from syphilis is in great measure thus satisfactorily accounted for.

Further, if syphilis and vaccination are at all associated, we should expect to find in some large community, where infantile vaccination has been in abeyance, a lower syphilitic death-rate amongst children than elsewhere. Leicester is such a community, yet, as a matter of fact, we find that whilst the syphilitic death-rate amongst infants has gone up some 25 per cent. in England and Wales generally in the last twenty years, it has risen as much as 69 per cent. in Leicester. Neglect of infantile vaccination in Leicester, therefore, has not arrested increase in its infantile syphilis death-rate.

That it is possible to inoculate syphilis in vaccination is not disputed, but the risk of its being so inoculated in actual practice, with the most ordinary precautions, is so infinitesimal as to scarcely need consideration, and, as recommended by the German Vaccination Commission of 1884, could be altogether avoided by the use of calf lymph.

As regards cancer, we find that the increase has been altogether in the later years of life, the mortality under 5 years of

age having actually diminished from 22 per million to 13 per million, and that the increase of mortality has been much greater among males than among females. It is therefore obviously unjust to lay at the door of vaccination any of the increase which in fact is, to a great extent, more apparent than real, being due to improvised diagnosis and more careful statement of cause on the part of medical men.

Erysipelas following vaccination stands on a somewhat different footing, being almost invariably the result of improper treatment of the vaccine vesicles, which could and ought to be avoided by the use of reasonable care and proper antiseptic methods. Speaking of this matter, Sir George Buchanan has pithily remarked: "I find from the last published annual report of the Registrar-General that 974 children under 1 year old were suffocated in a twelvemonth by bedclothes; the fact gives a reason for care in the use of bed-clothes, but gives no reason for going without them." So in regard to vaccination and the occasional occurrence of post-vaccinal disease.

Considering the millions of vaccinations that have been performed, if evil results after vaccination were a rule rather than the rarest of exceptions it ought to have been a comparatively easy task to collect such an imposing array of disasters as would have condemned vaccination for ever. Yet after travelling throughout the world in search of such disasters, a very poor collection, comparatively speaking (judging at least from the evidence already published), has been laid before the Royal Commission on Vaccination. What the Commission think of that evidence remains yet to be seen; but antivaccinators cannot at all events complain that they have not been allowed the freest of hands in the presentation of their case.

Conclusion.

The evidence in favour of vaccination has been by no means exhausted in this report. The space at command has not admitted of more than an indication of the chief arguments for and against. But sufficient has been given to show the overwhelming nature of the evidence in favour of vaccination, and the comparative thinness, as well as the frequent un-

trustworthiness and exaggeration, of the arguments on the other side. Speaking broadly, it has been shown that, taking the whole population, small-pox is no longer the scourge of infancy that it formerly was; but it has at the same time been seen that the unvaccinated children of to-day suffer in the presence of an epidemic as severely as such children ever did, and that the decrease both of attack and of mortality is confined to the vaccinated. It has been shown that efficient infantile vaccination protects almost absolutely from death and from severe attack, and, with comparatively few exceptions, from small-pox attack of any kind during the first ten years or so of life, but that after that age its protective power gradually wears off unless the vaccination be efficiently repeated. It has further been shown that, notwithstanding the gross exaggerations and distortions of the antivaccinators, the risks attending vaccination properly performed are, when compared with the gigantic saving of life, health, and beauty which vaccination has effected, so infinitesimal that they may be disregarded, excepting so far as they should accentuate the care to be taken by medical men in performing the operation. It is urged by some people, with some show of plausibility, that, however beneficial vaccination may be, to have it generally compulsory is an intolerable infringement of the liberty of the subject. These good people overlook the fact that the proved benefits of vaccination affect specially the helpless infantile portion of the community, who have as yet no voice in the matter, and that a person who neglects to avail himself of the means of protecting himself against small-pox is a serious menace, nuisance, and indirect cause of expense to the community in which he resides. Others, again, think that, as in the "Leicester system," the proper substitute for vaccination is compulsory "quarantine" for ten or twelve days, forgetting, apparently, that even Leicester, the parent of this Utopian system, still finds it absolutely necessary to protect its small-pox hospital staff, etc., by vaccination. Most people will agree, after looking seriously at the question, that a quarantine of ten or twelve days is a form of compulsion vastly more costly, dangerous, "leaky," and individually irksome than that of vaccination. I happen to have before me a

copy of a report of an outbreak of small-pox last year in a Midland village of some 1,300 inhabitants, from which it appears that on the introduction of the first case, the house in which the patient had taken up her quarters was "barricaded all round," no one being allowed to go near it, and all food, etc., being placed at a distance by a person appointed by the local authority, and left there until some of the inmates of the house could fetch them. This reminds one of the plague in the Middle Ages rather than the closing years of the 19th century. Proper vaccination and revaccination would have effected the desired object much more humanely and cheaply. As it turned out, the unfortunate healthy inmates of this house caught the disease in due course.

In conclusion, I would urge upon the general public not to accept, without careful investigation and full proof, any assertion or contention against vaccination, and not to allow a natural dislike to a temporary sore on a child's arm to prejudice them against an operation which has been shown to be otherwise beneficial. Upon the Legislature I would urge that revaccination, as well as primary vaccination, should be made compulsory, as in Germany; and medical practitioners I would strongly urge not to vaccinate in any case except in the most efficient manner. If these suggestions were acted upon, vaccination would soon be completely vindicated.

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